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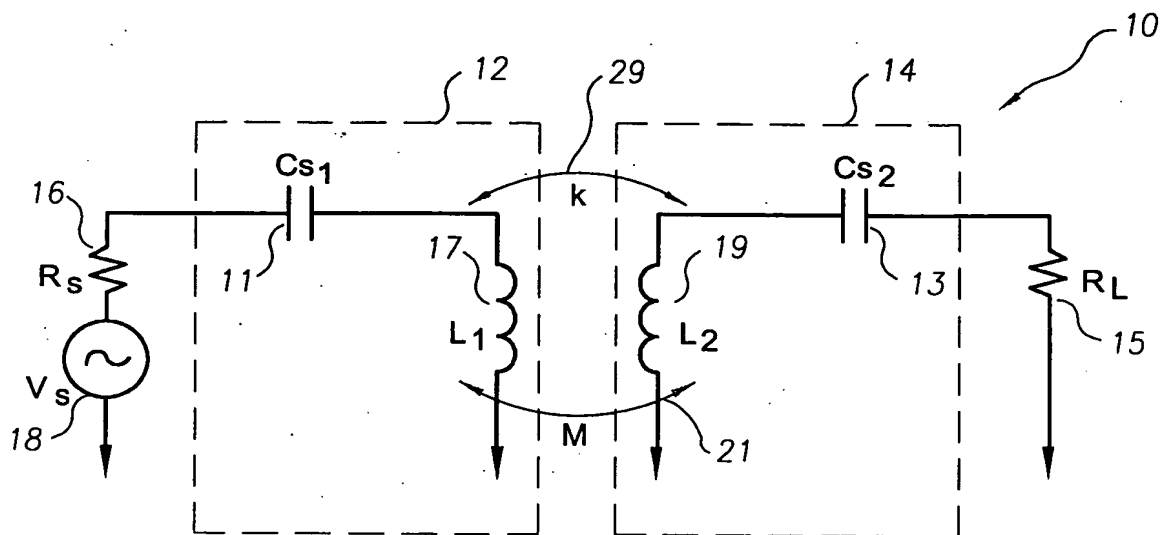


FIG. 1a (Prior Art)

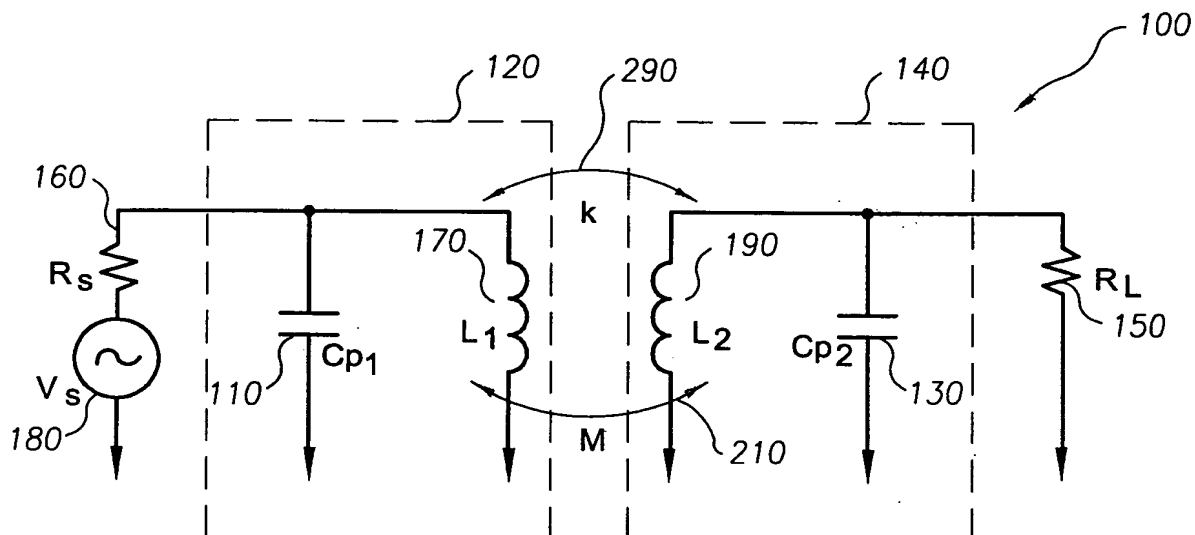


FIG. 1b (Prior Art)

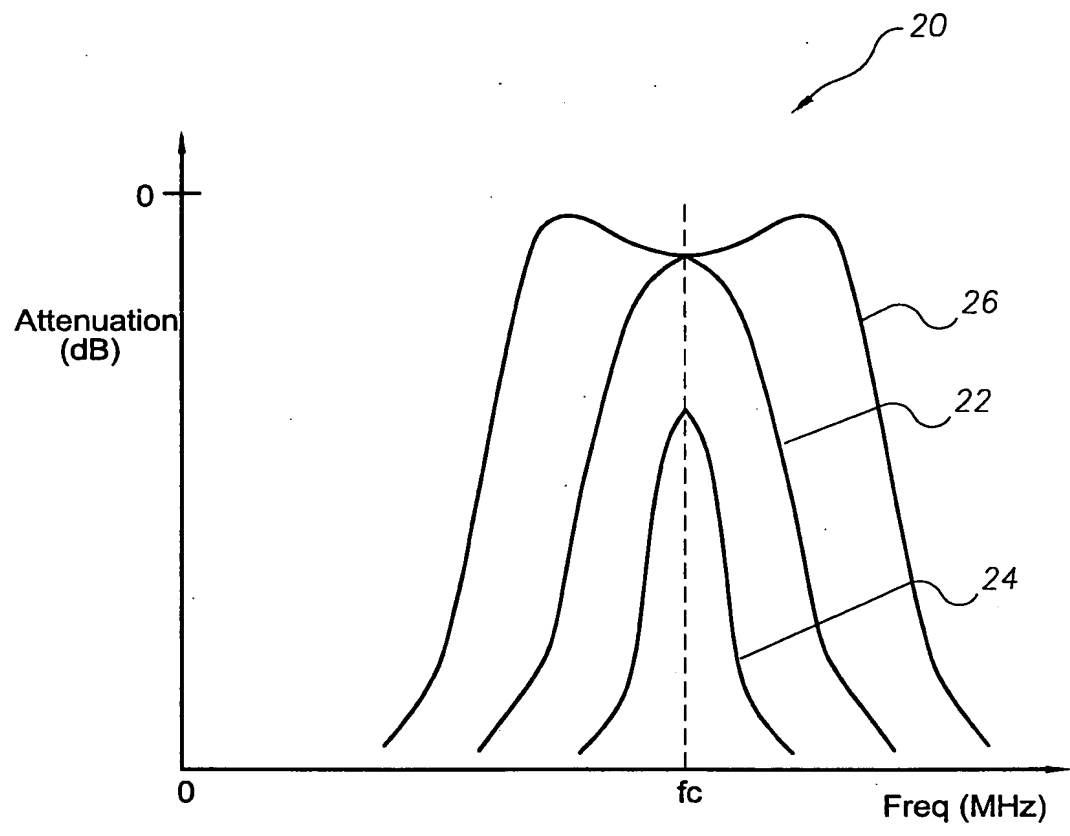
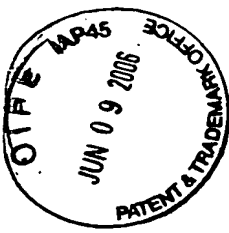
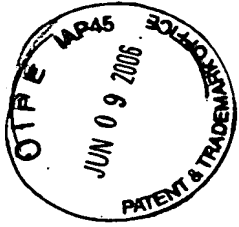


FIG. 2



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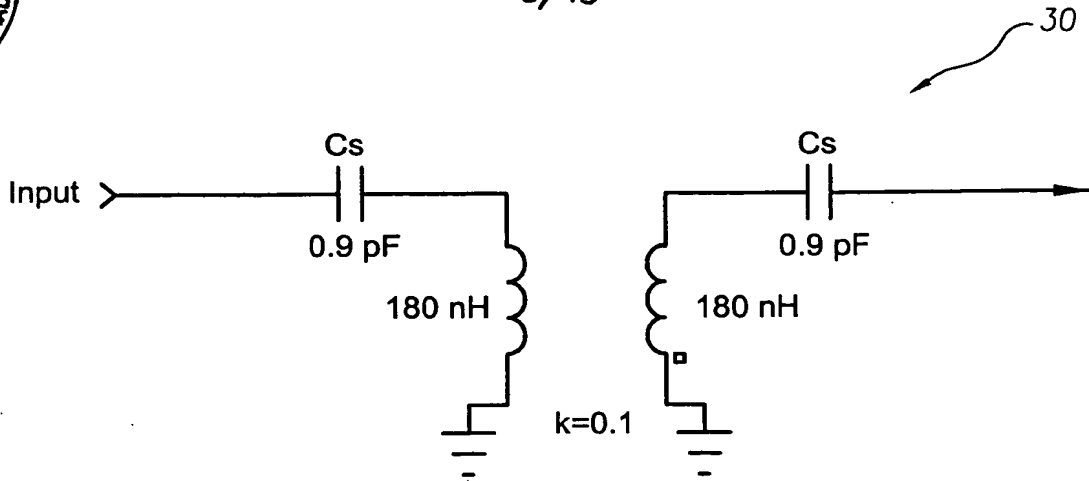
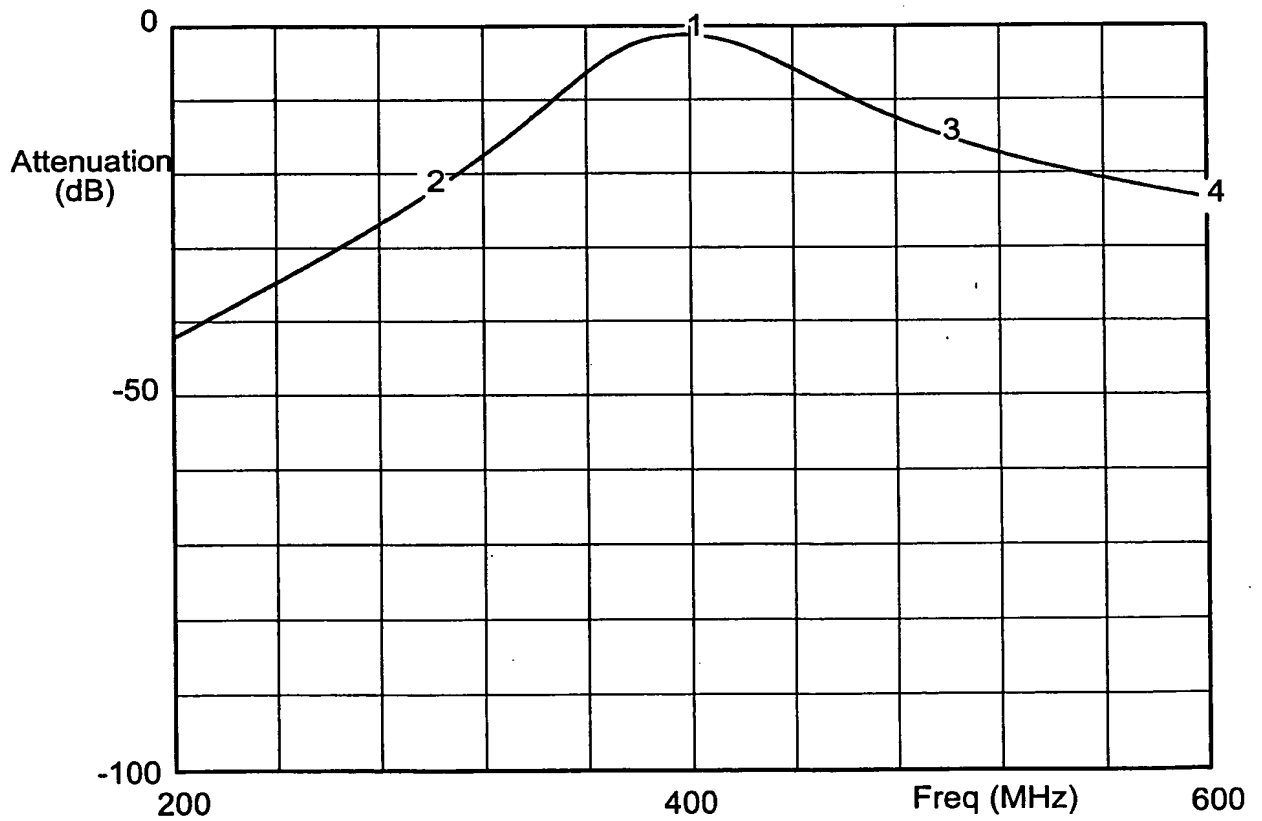
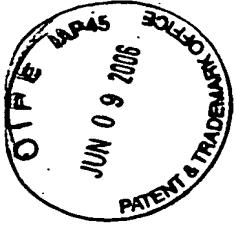


FIG. 3 (Prior Art)



DB[S21]			
1 { 400	2 { 300	3 { 500	4 { 600
-1.19704	-22.4326	-15.0734	-23.2958

FIG. 4A (Prior Art)



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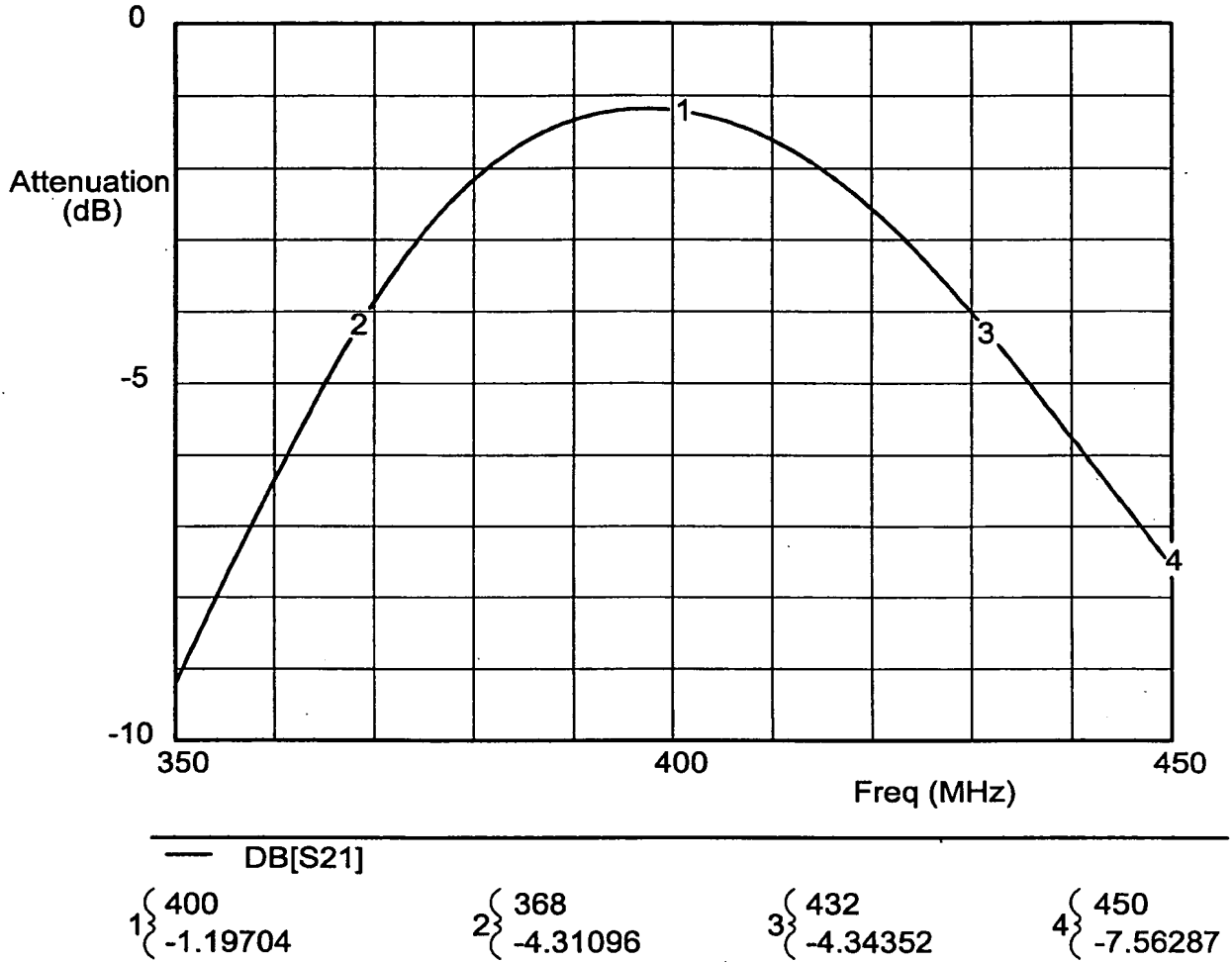
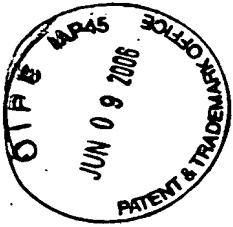


FIG. 4b (Prior Art)



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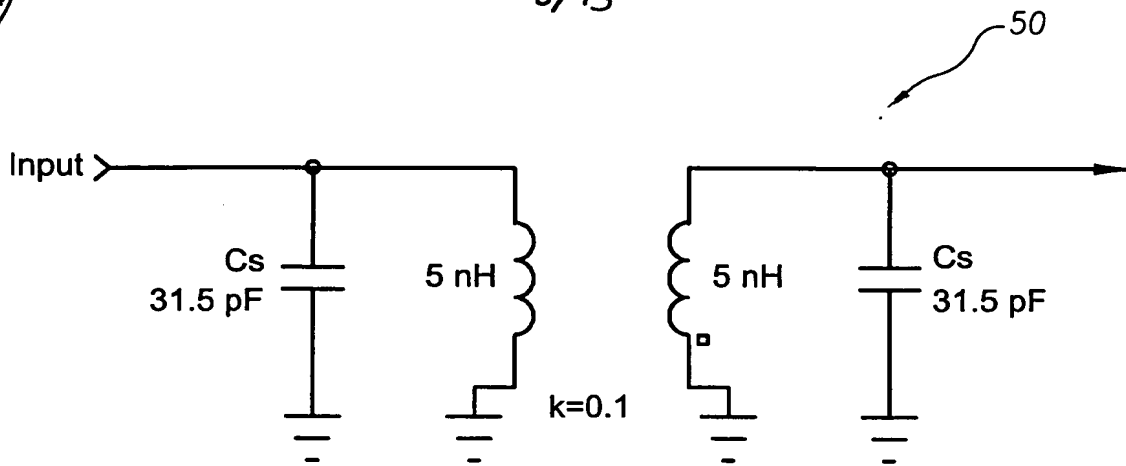


FIG. 5 (Prior Art)

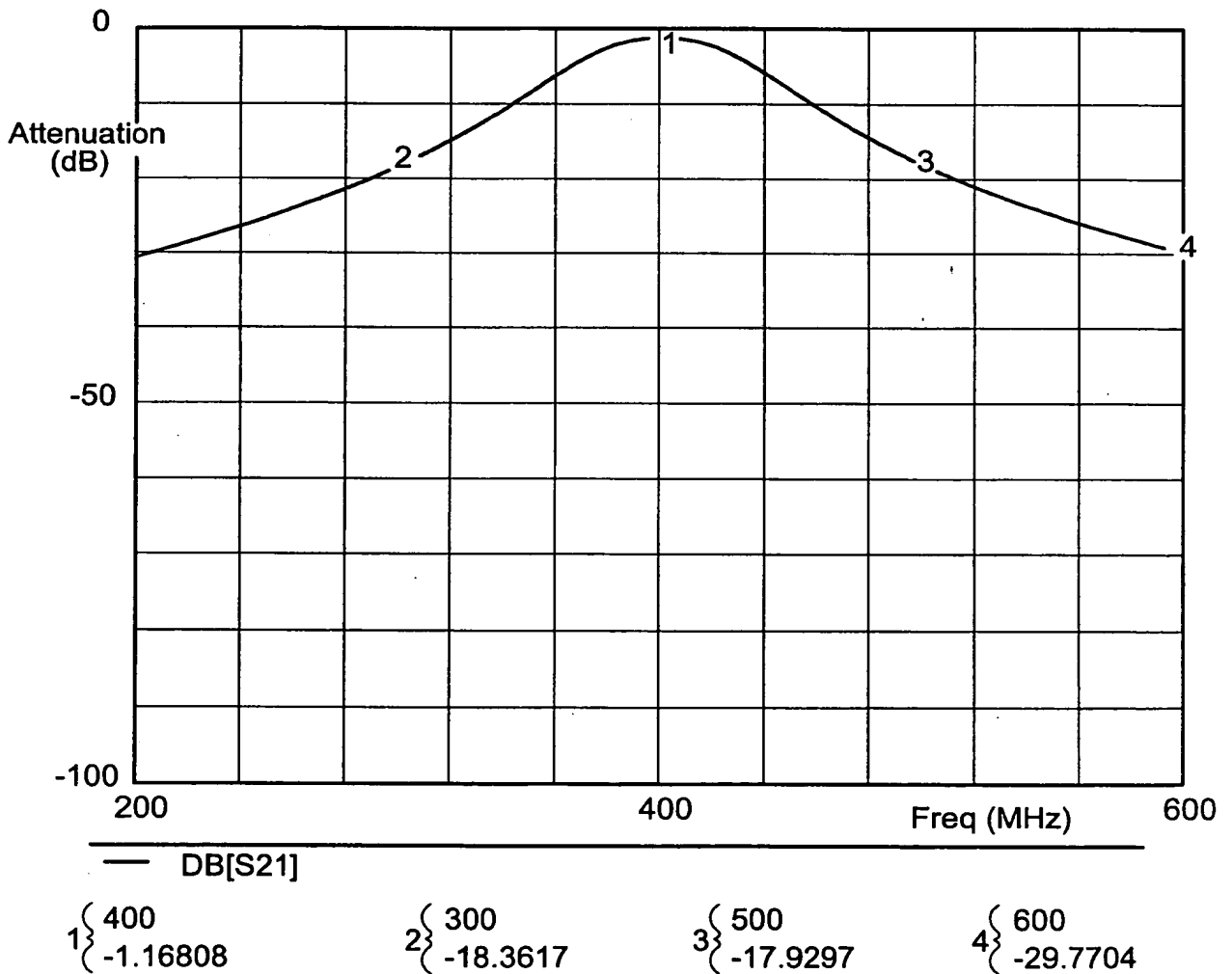


FIG. 6a (Prior Art)



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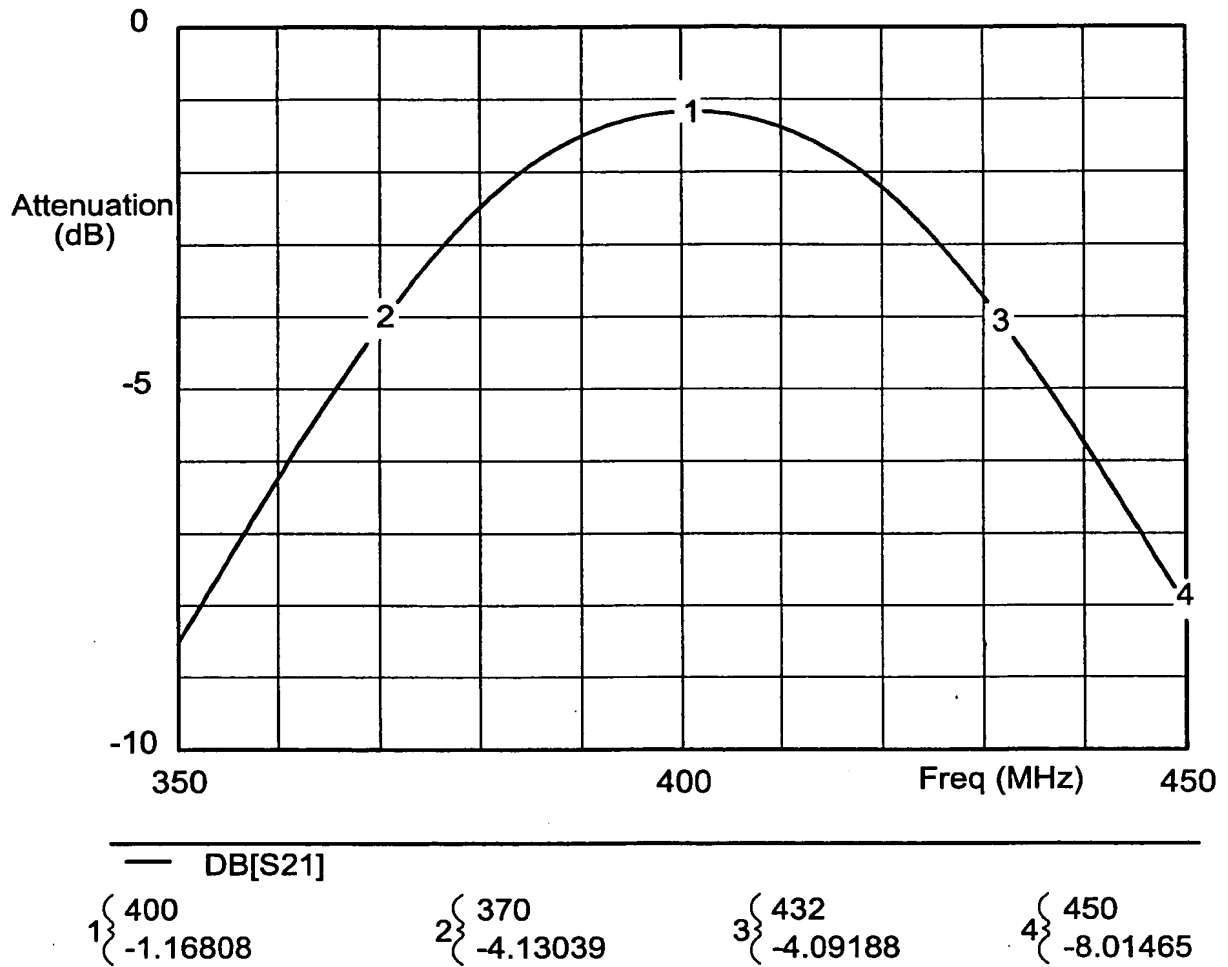
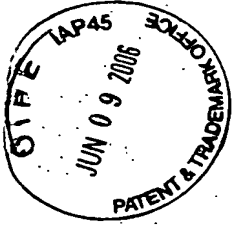


FIG. 6b (Prior Art)



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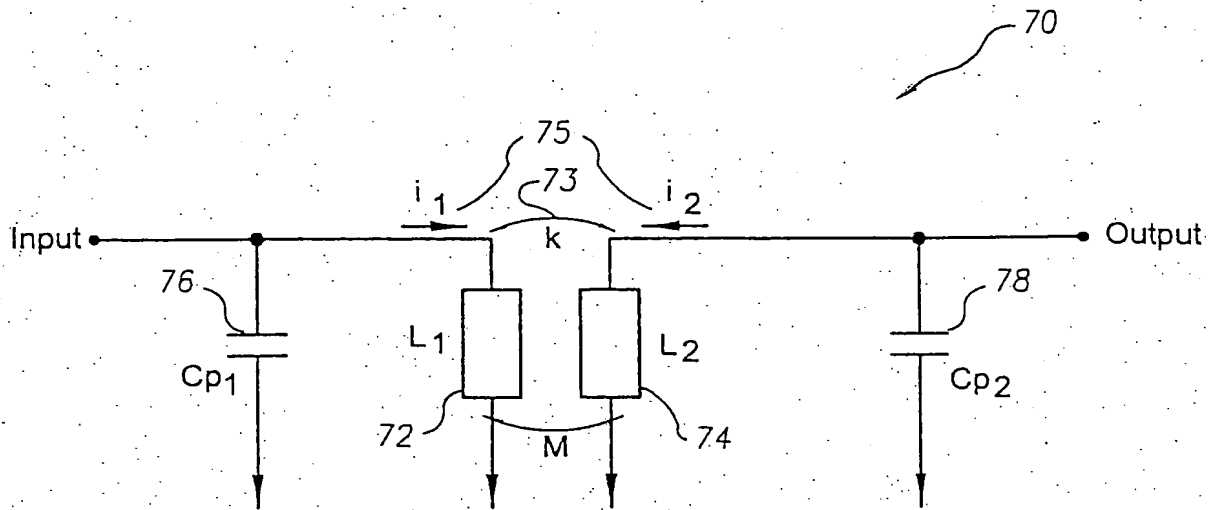


FIG. 7

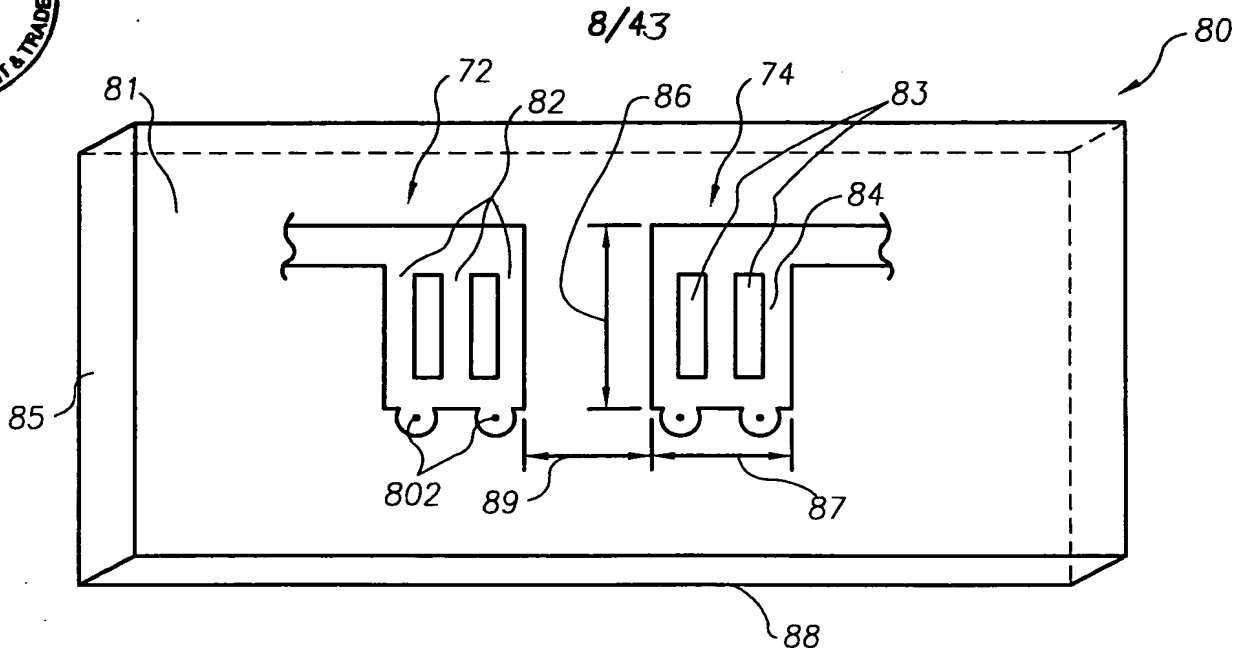
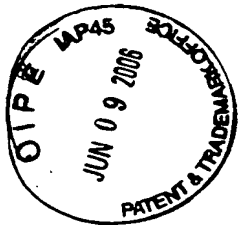
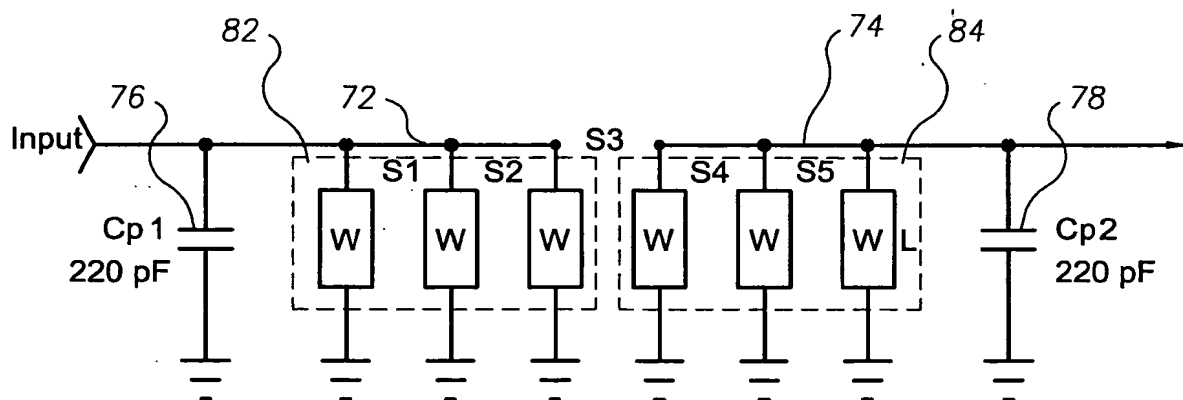
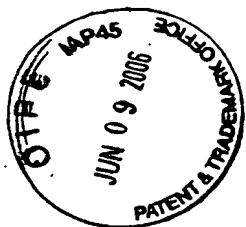


FIG. 8a



Multistrip_coupled microstrip
 line(2 resonators, 3 lines each)
 Width $W=2$ mm, Length $L=5.5$ mm
 Gaps: $S1=S2=S4=S5=3.45$ mm
 $S3 = 3$ mm
 Dielectric: $\epsilon_r=4.65$, $\tan\delta=0.001$
 Board thickness (hight) $H=1.5$ mm

FIG. 8b



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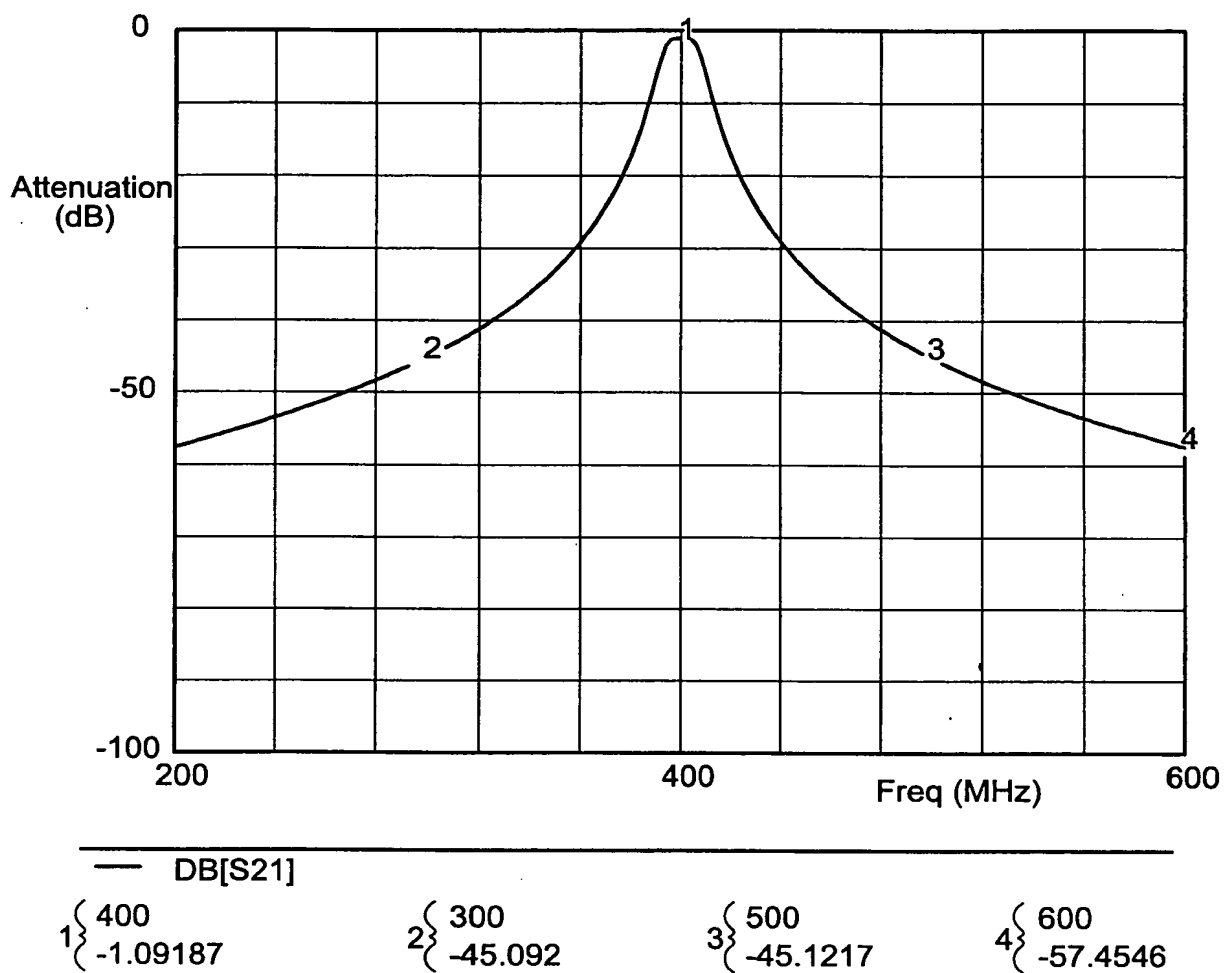
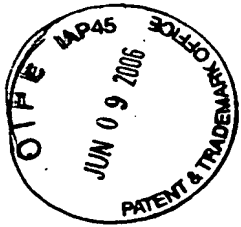


FIG. 9a



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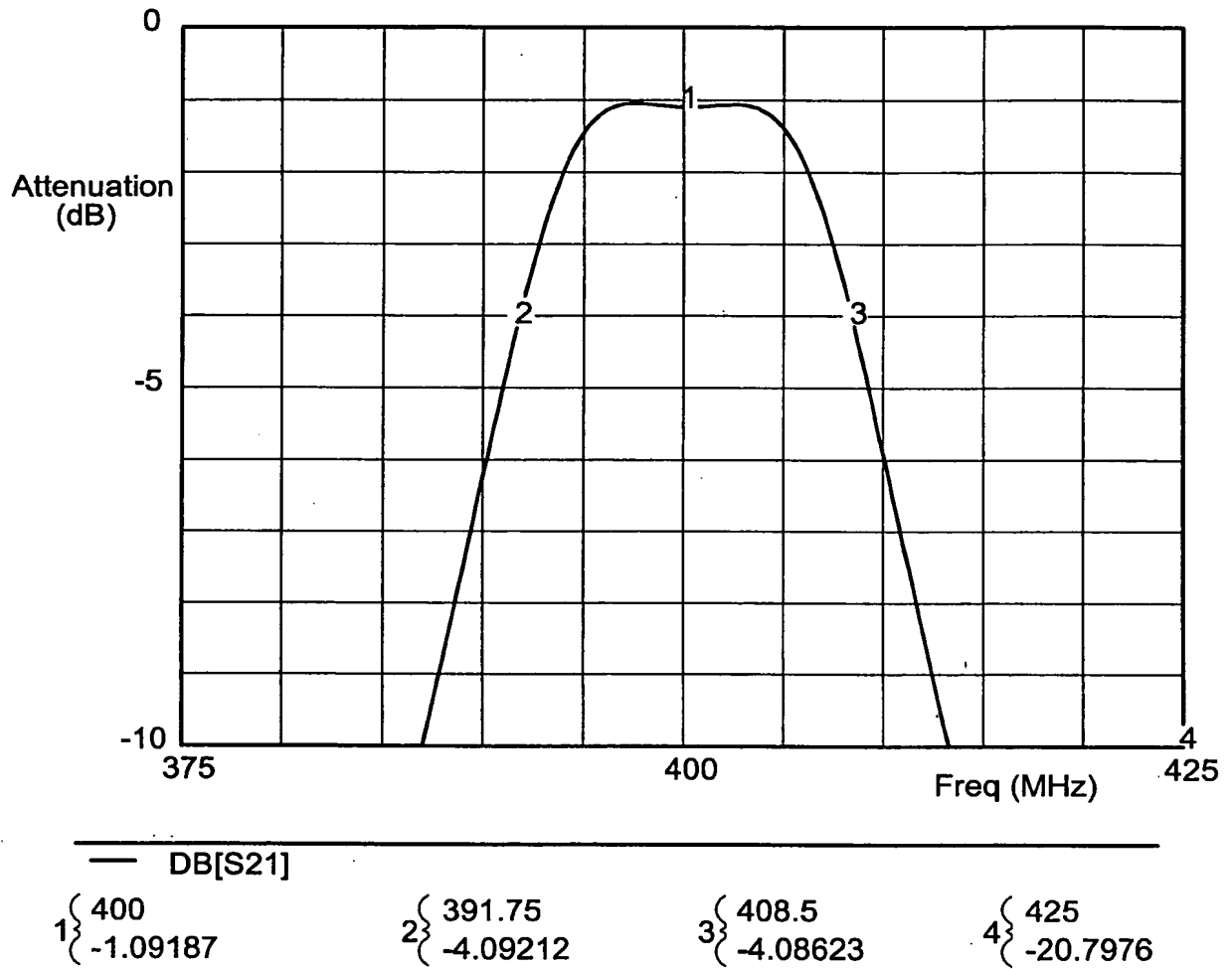


FIG. 9b

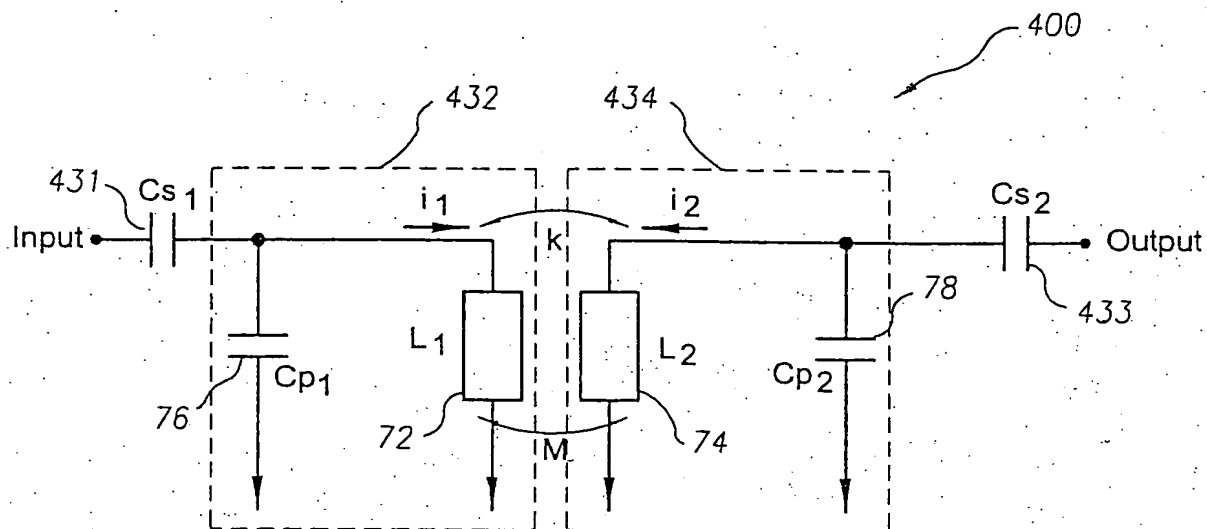
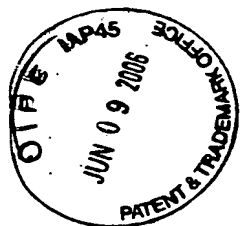
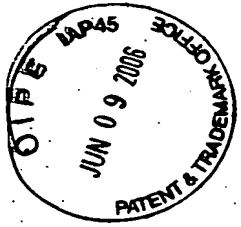


FIG. 10a



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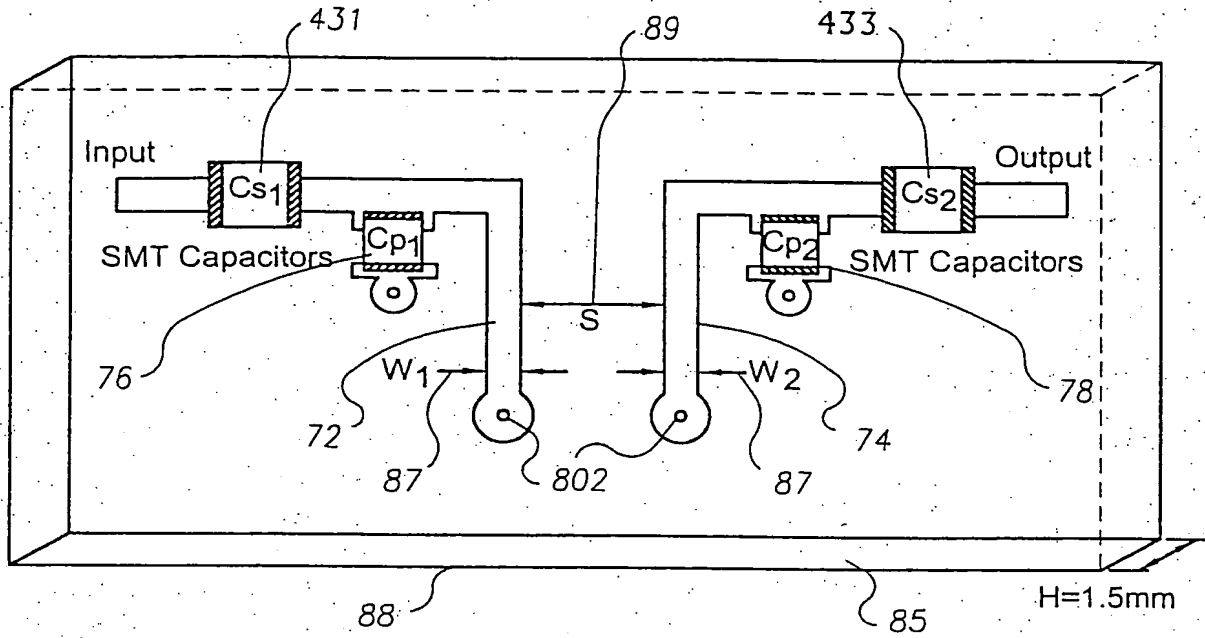
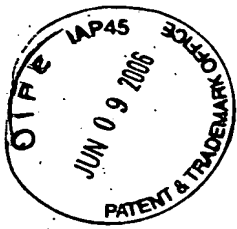


FIG. 10b



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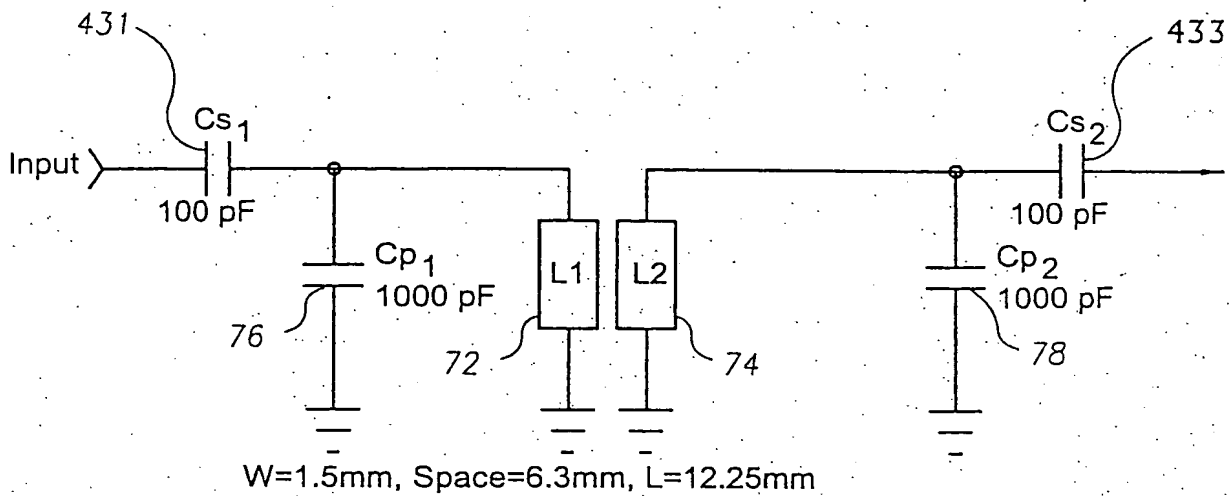
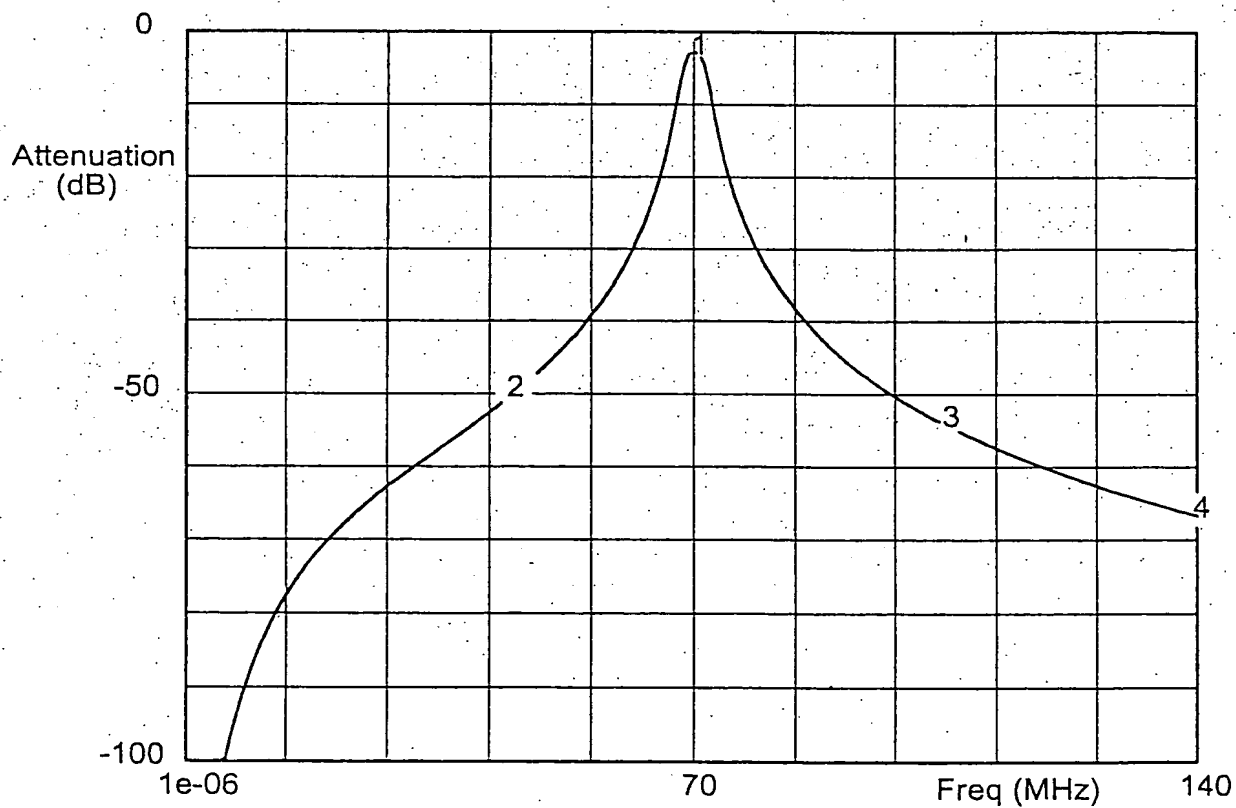
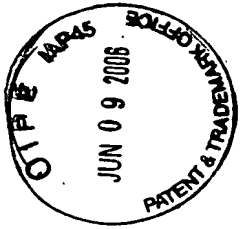


FIG. 11



DB[S21]			
1 { 70	2 { 44.8	3 { 105	4 { 140
-2.7315	-50.2972	-54.2752	-66.7522

FIG. 12a



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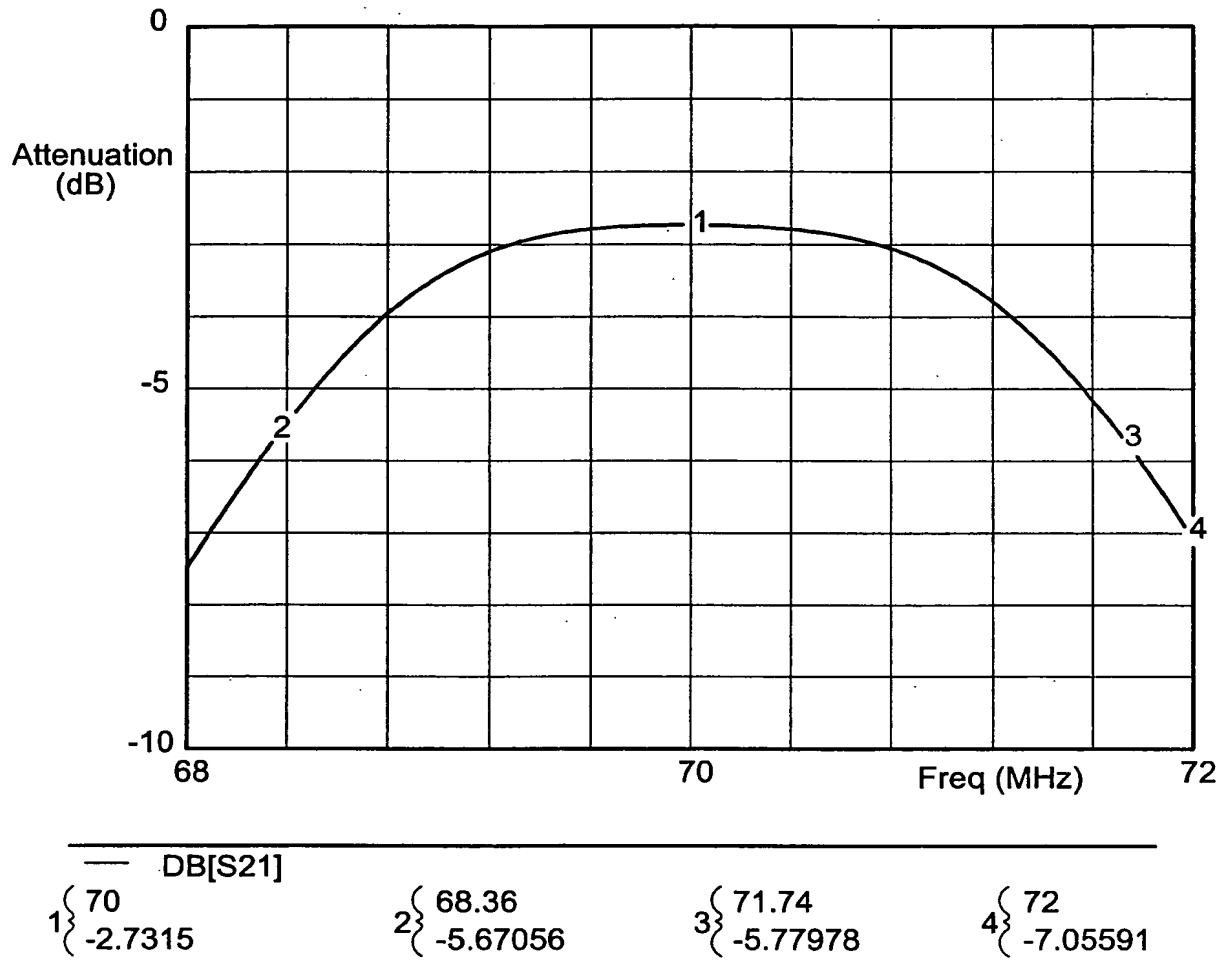
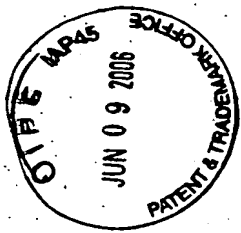


FIG. 12b



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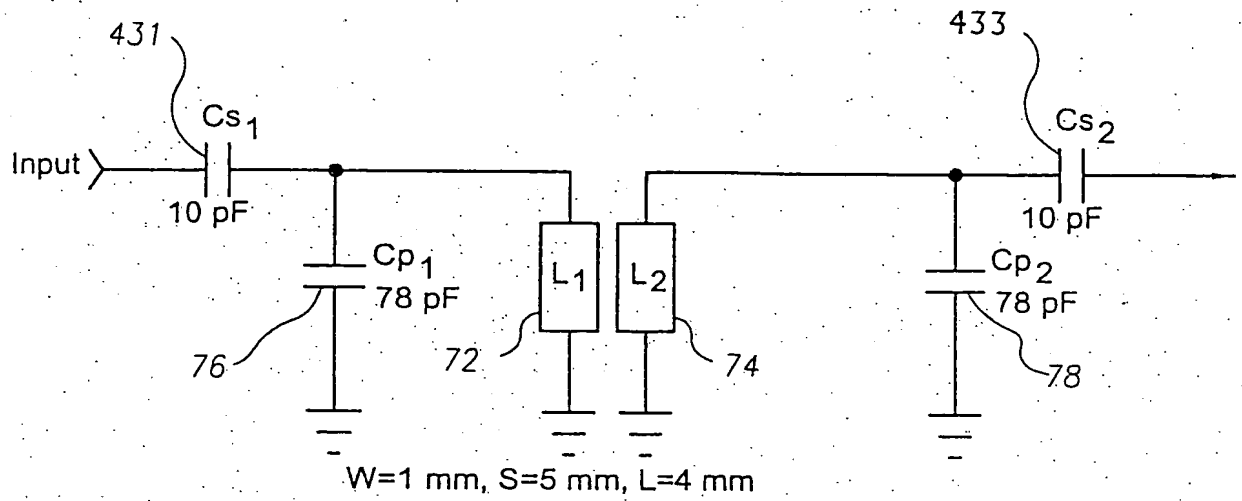


FIG. 13

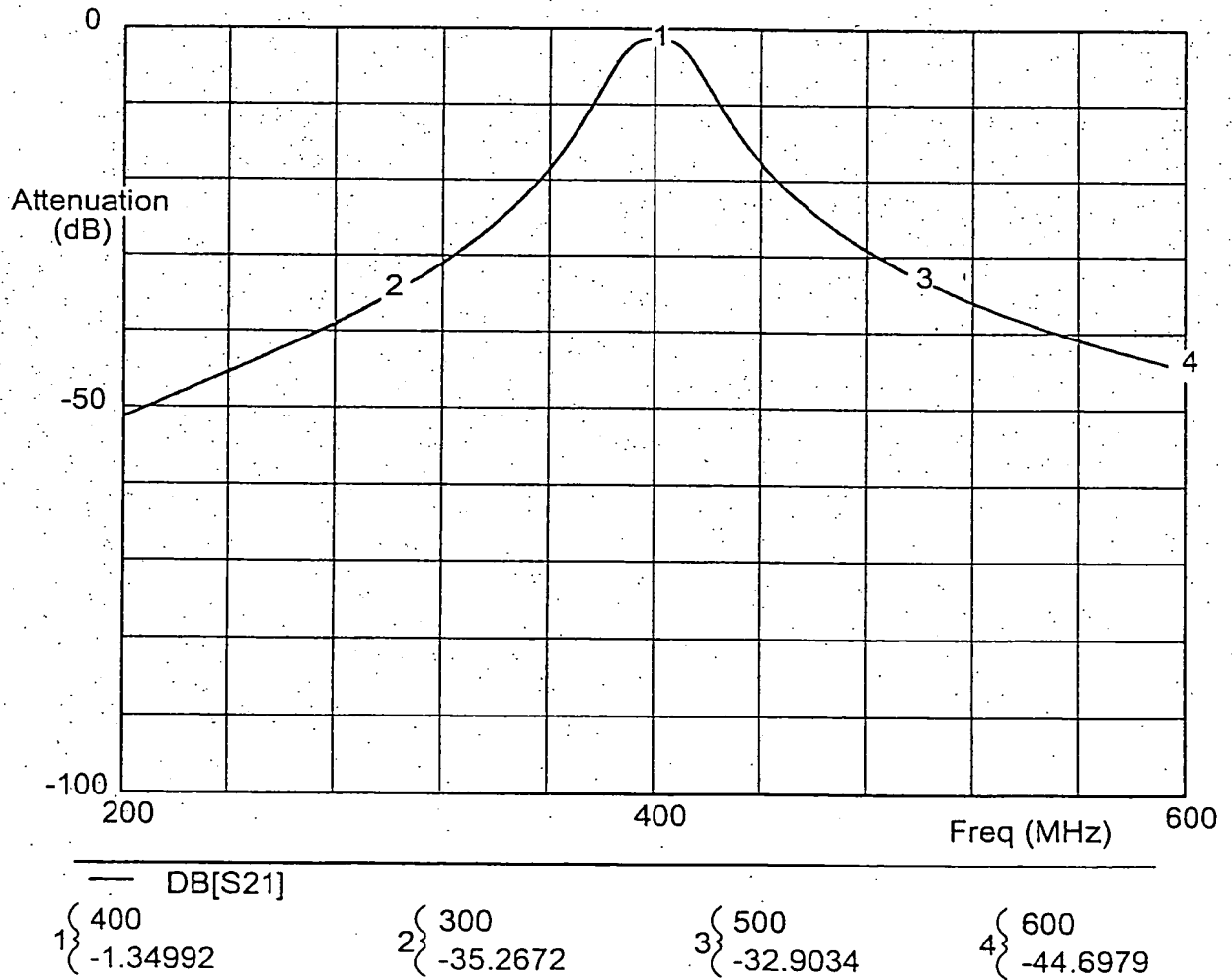
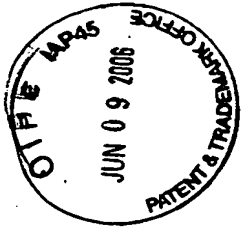


FIG. 14a



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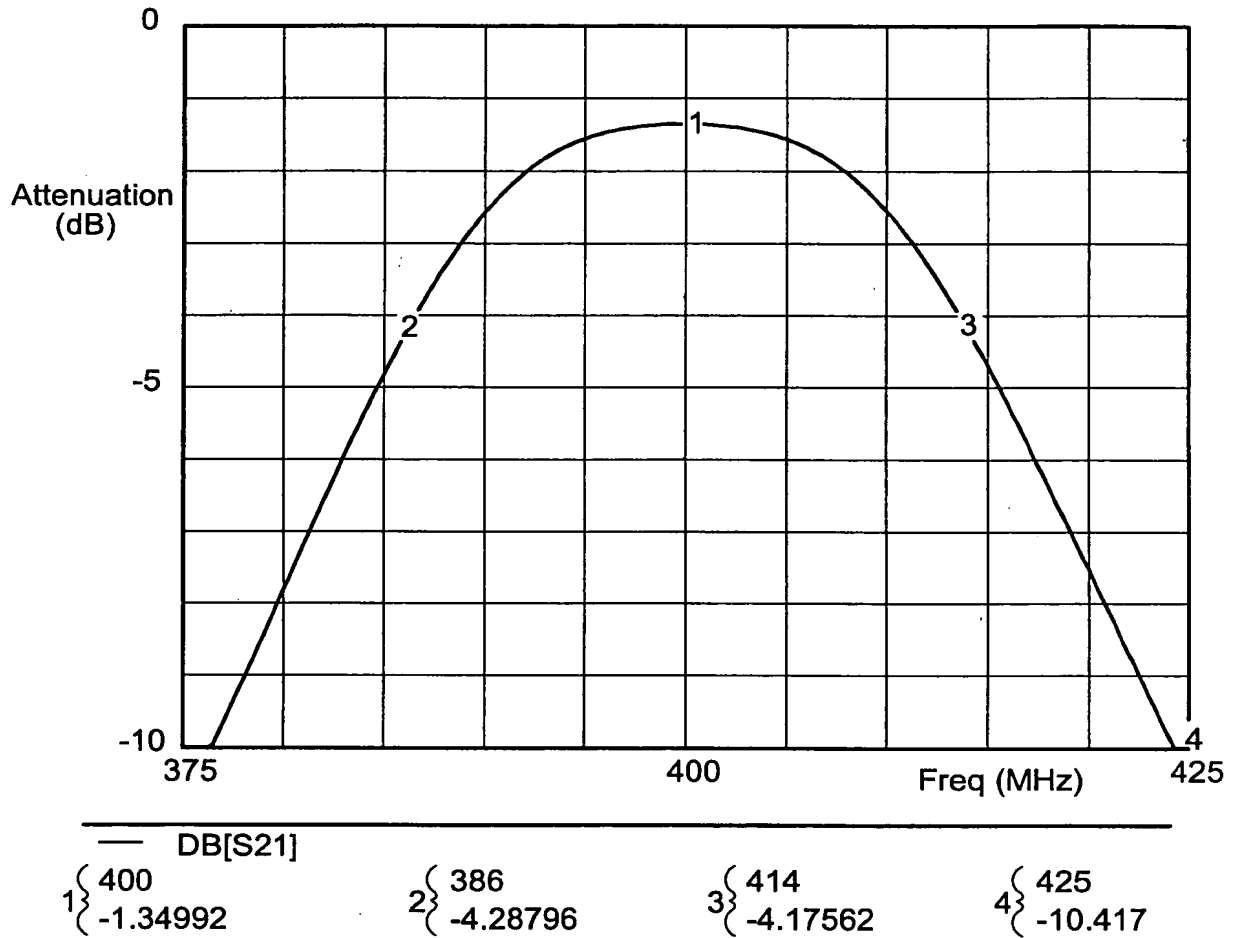


FIG. 14b

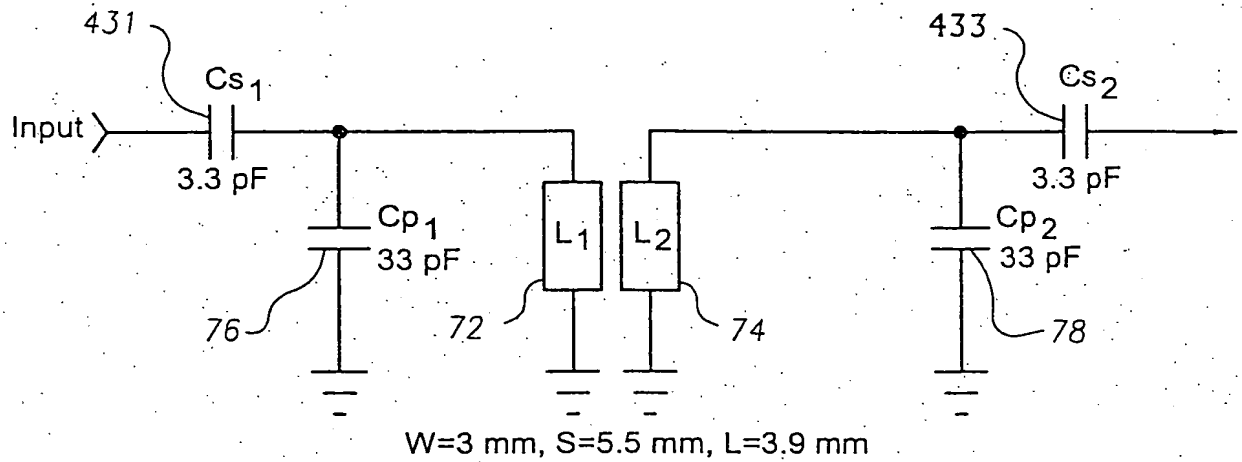
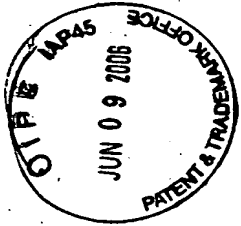


FIG. 15

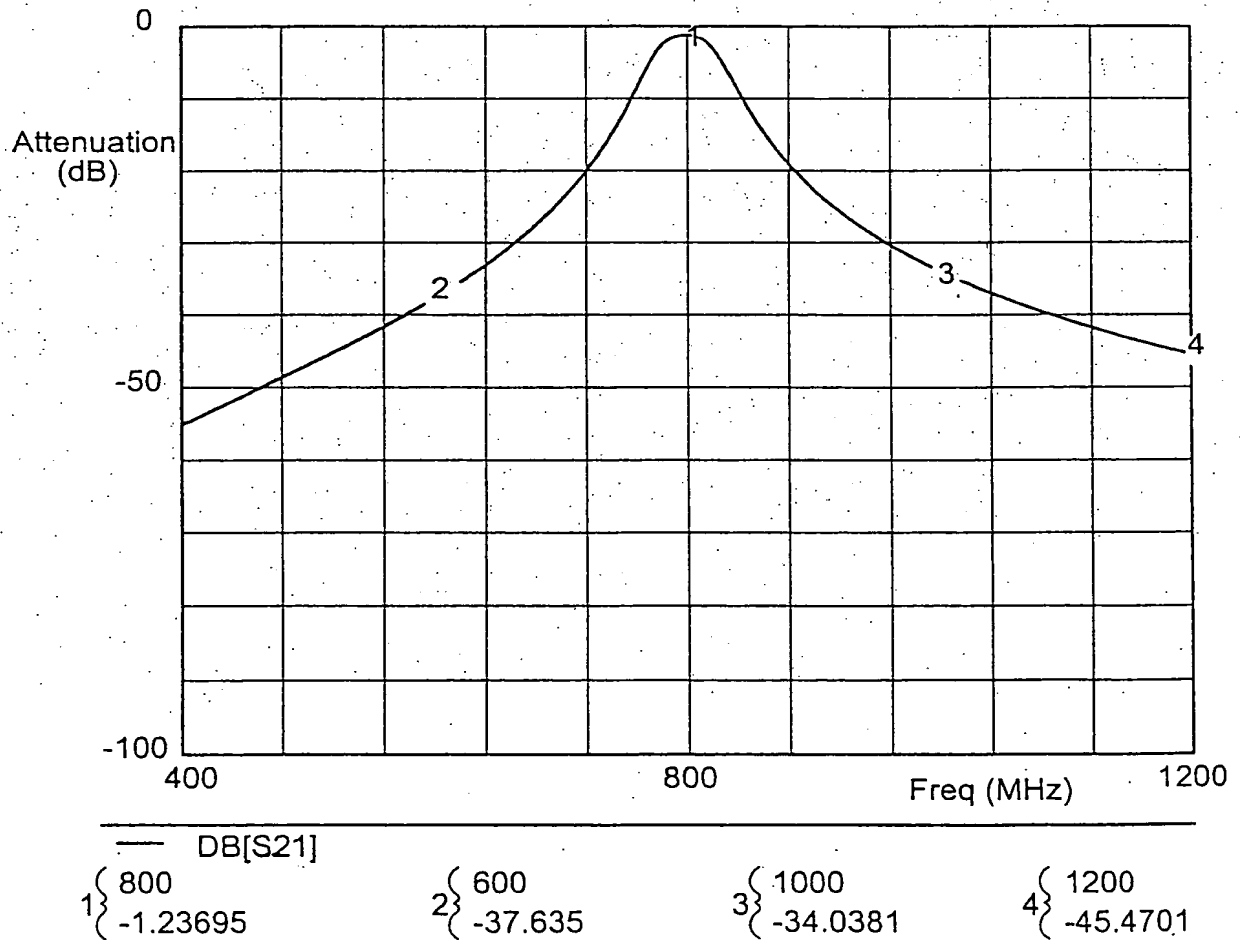
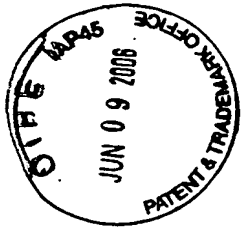


FIG. 16a



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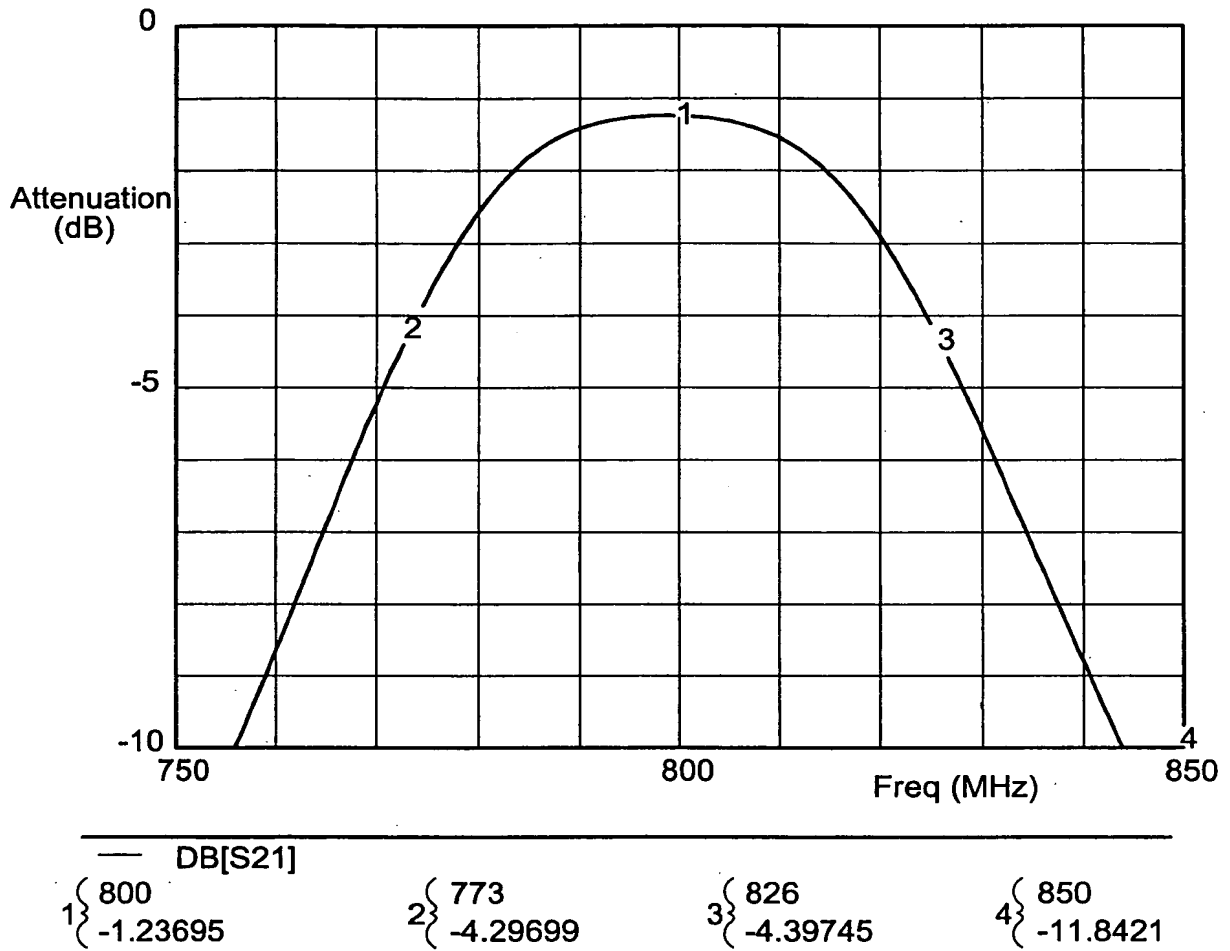
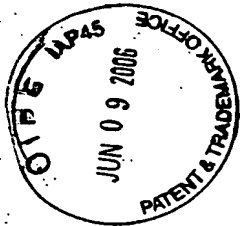
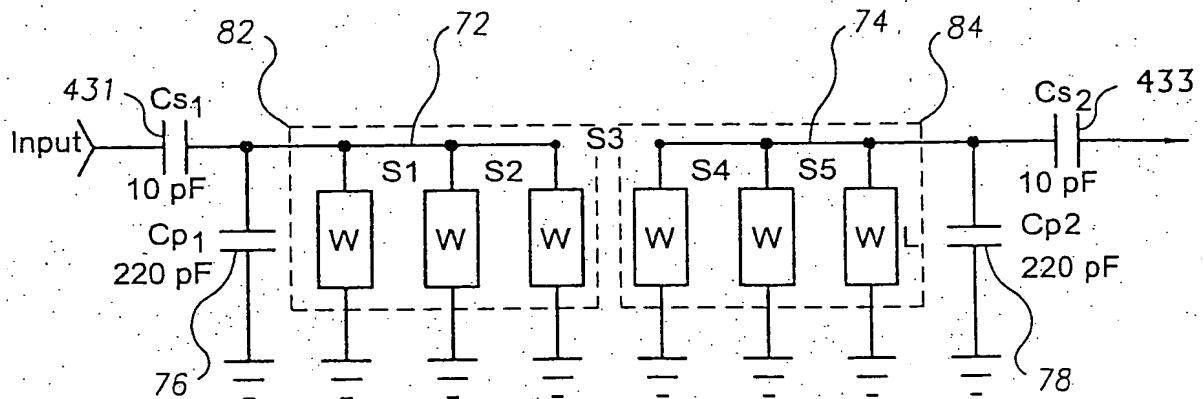


FIG. 16b

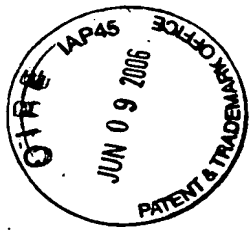


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Multistrip_coupled microstrip
 line(2 resonators, 3 lines each)
 Width $W=2$ mm, Length $L=5.5$ mm
 Gaps: $S1=S2=S4=S5=3.85$ mm
 $S3 = 4$ mm
 Dielectric: $\epsilon_r=4.65$, $\tan\delta=0.001$
 Board thickness (hight) $H=1.5$ mm

FIG. 17



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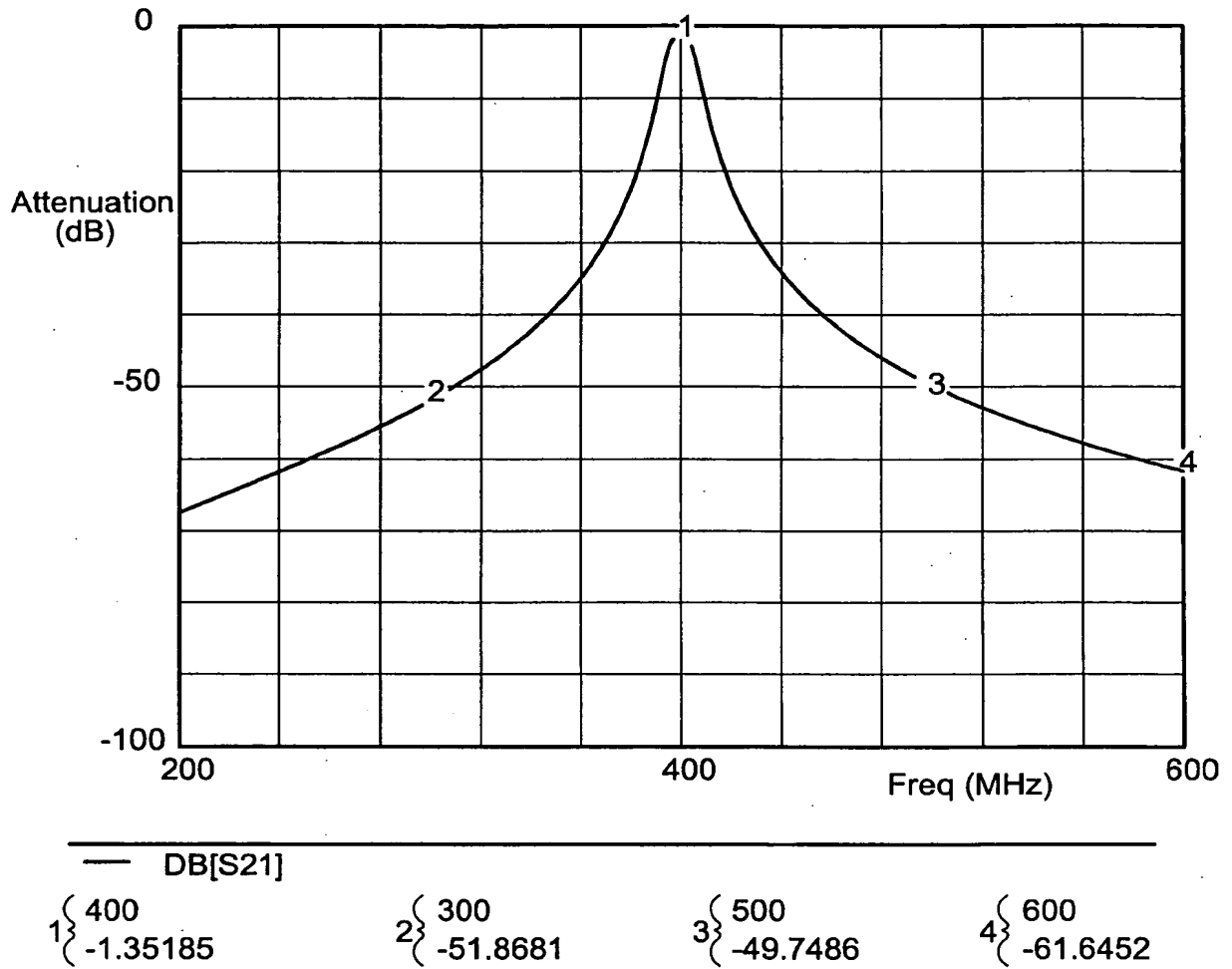
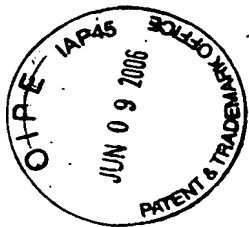
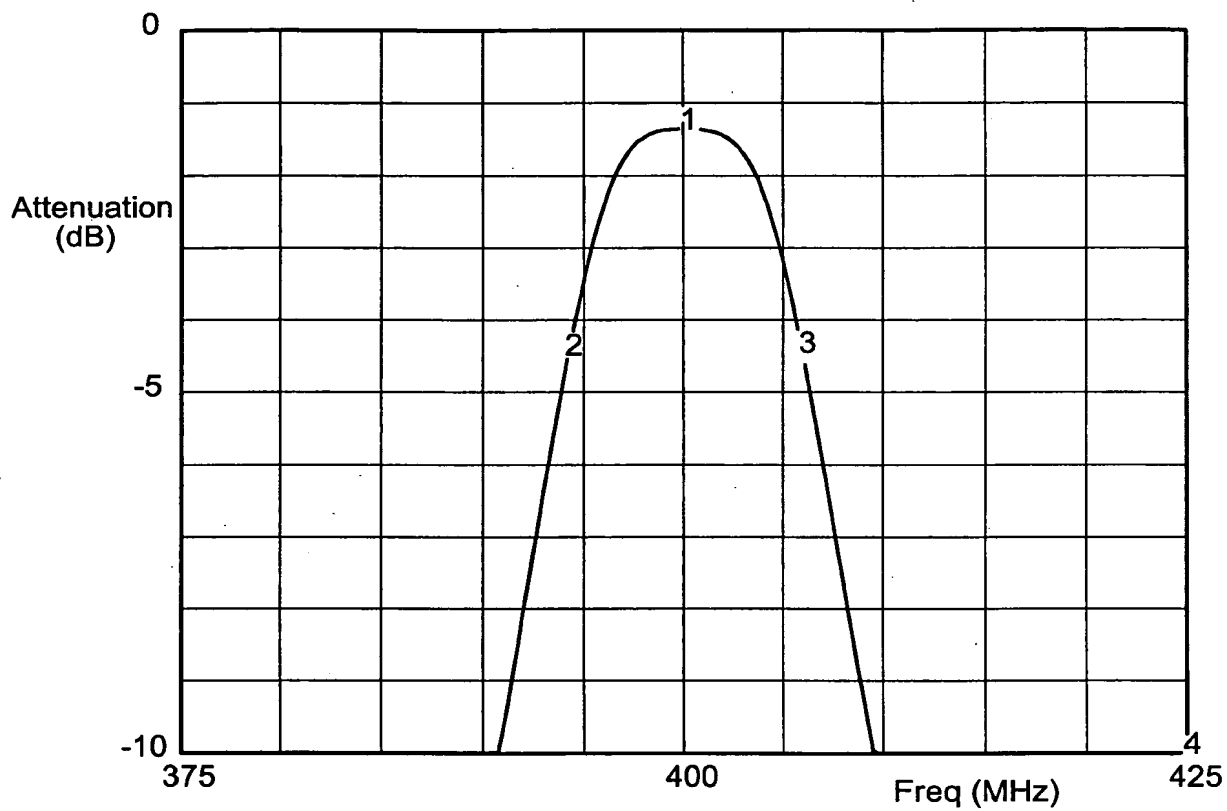


FIG. 18a

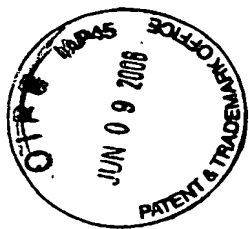


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— DB[S21]			
1 { 400	2 { 394.25	3 { 406	4 { 425
-1.35185	-4.47513	-4.43991	-26.022

FIG. 18b



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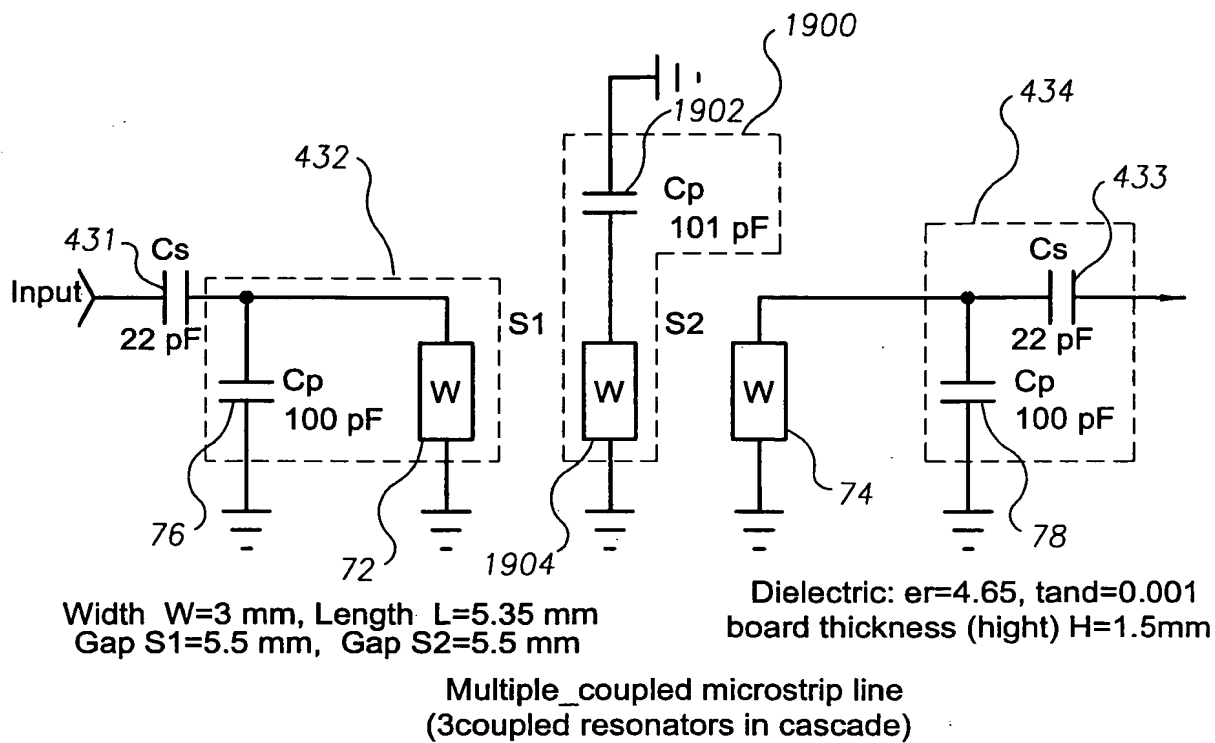
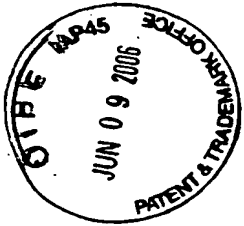
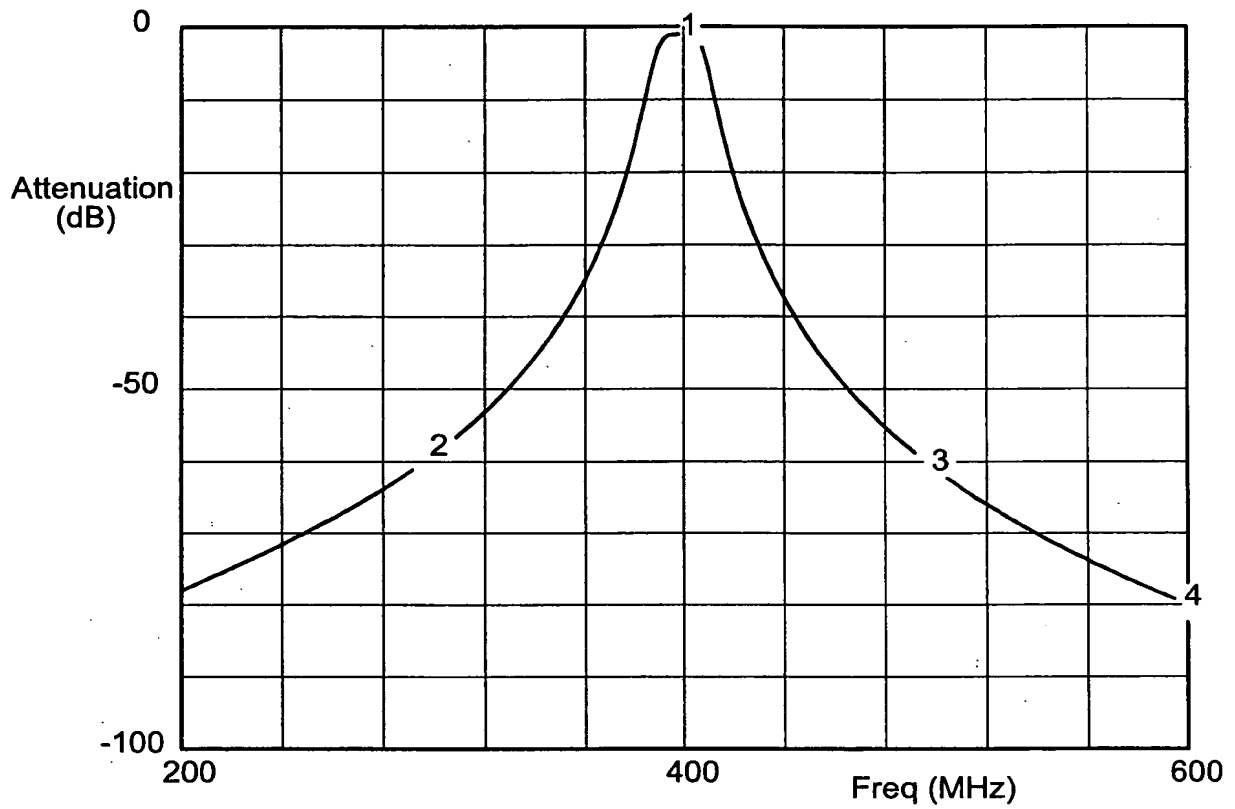


FIG. 19



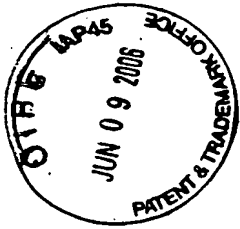
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— DB[S21]

Point	Freq (MHz)	Attenuation (dB)
1	400	-1.05798
2	300	-59.0384
3	500	-61.1136
4	600	-80.0114

FIG. 20a



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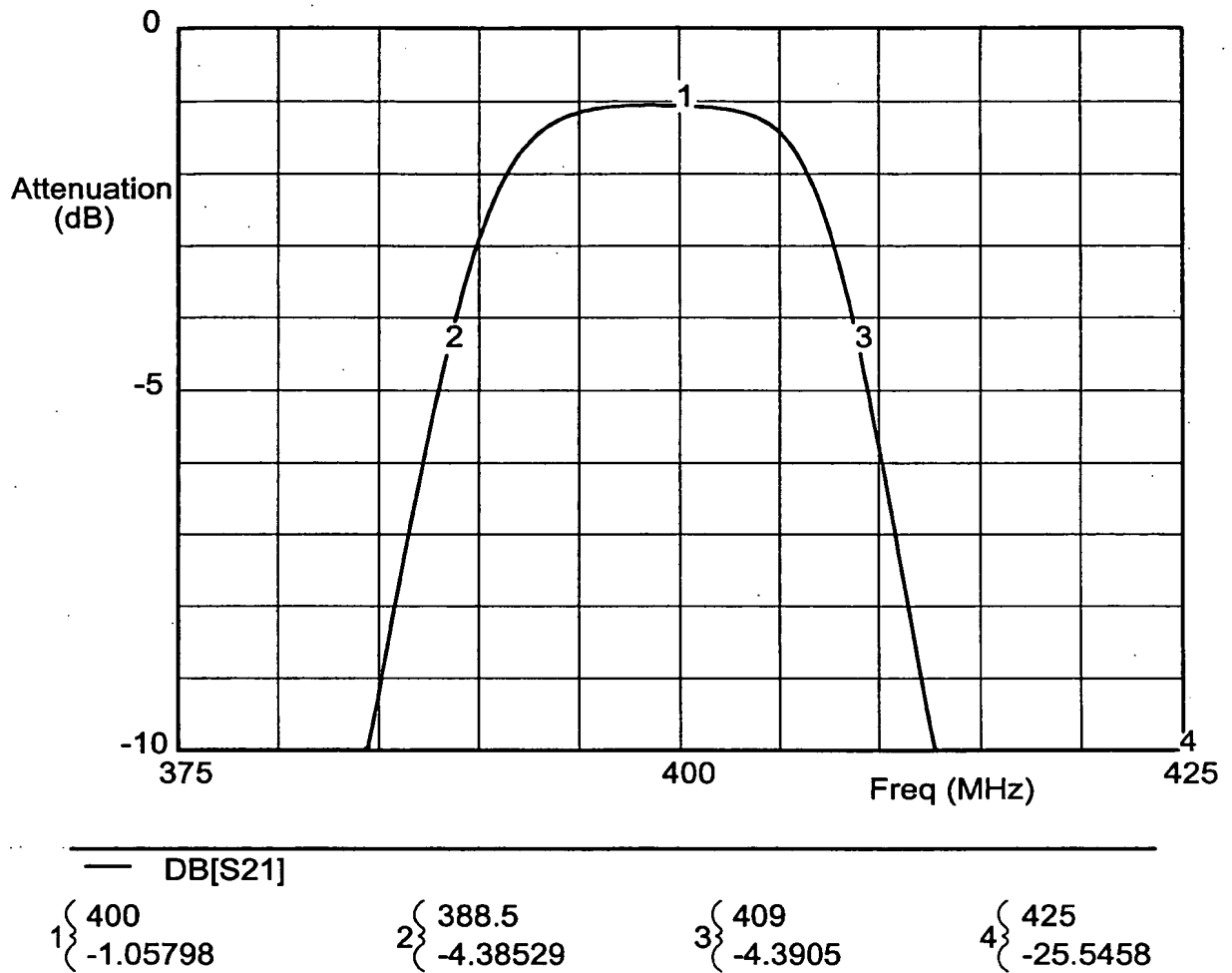
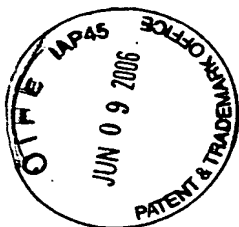


FIG. 20b



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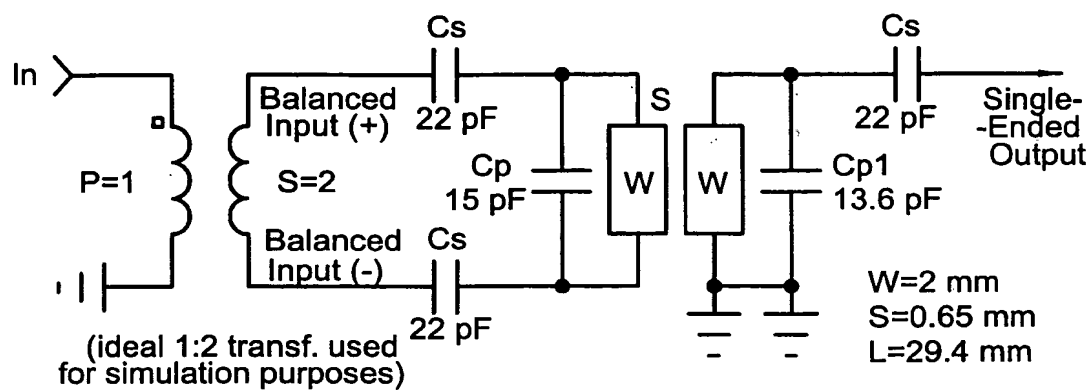


FIG. 21

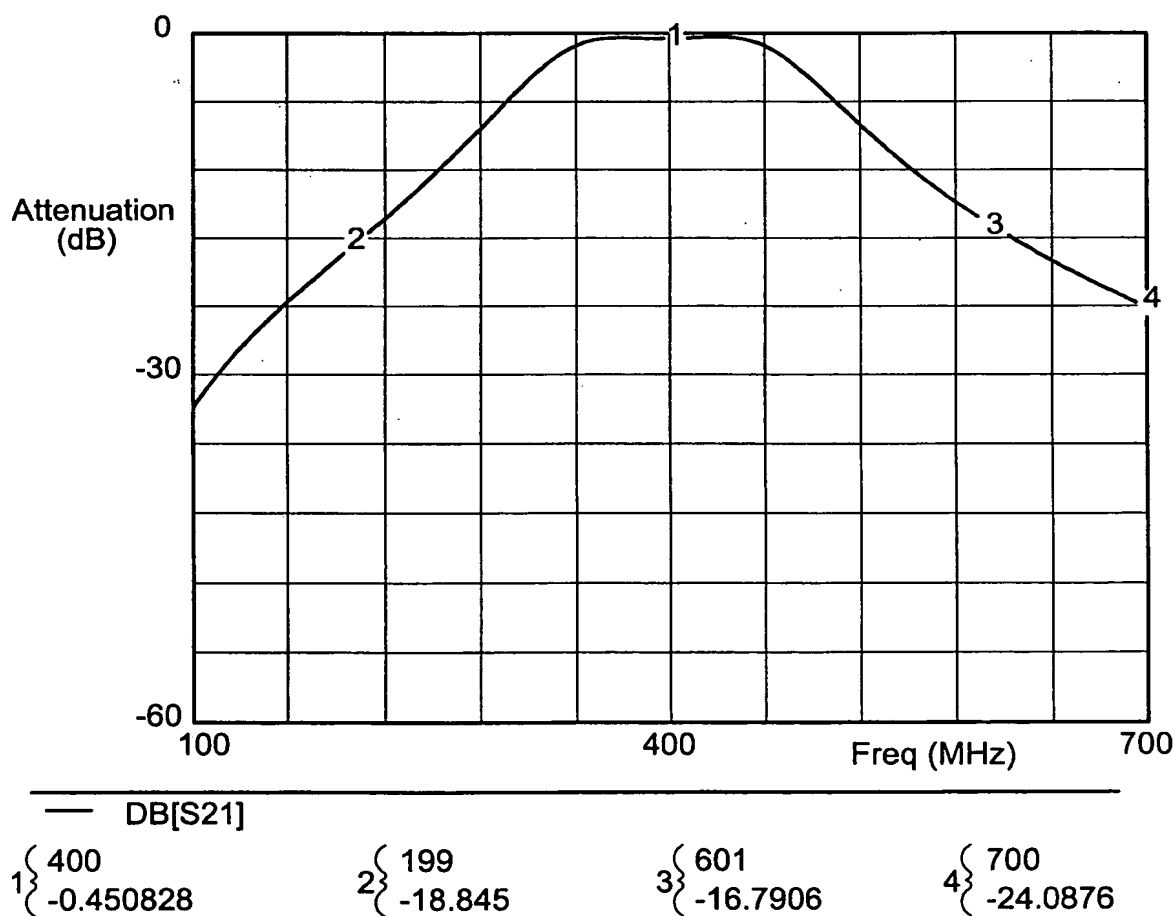


FIG. 22a



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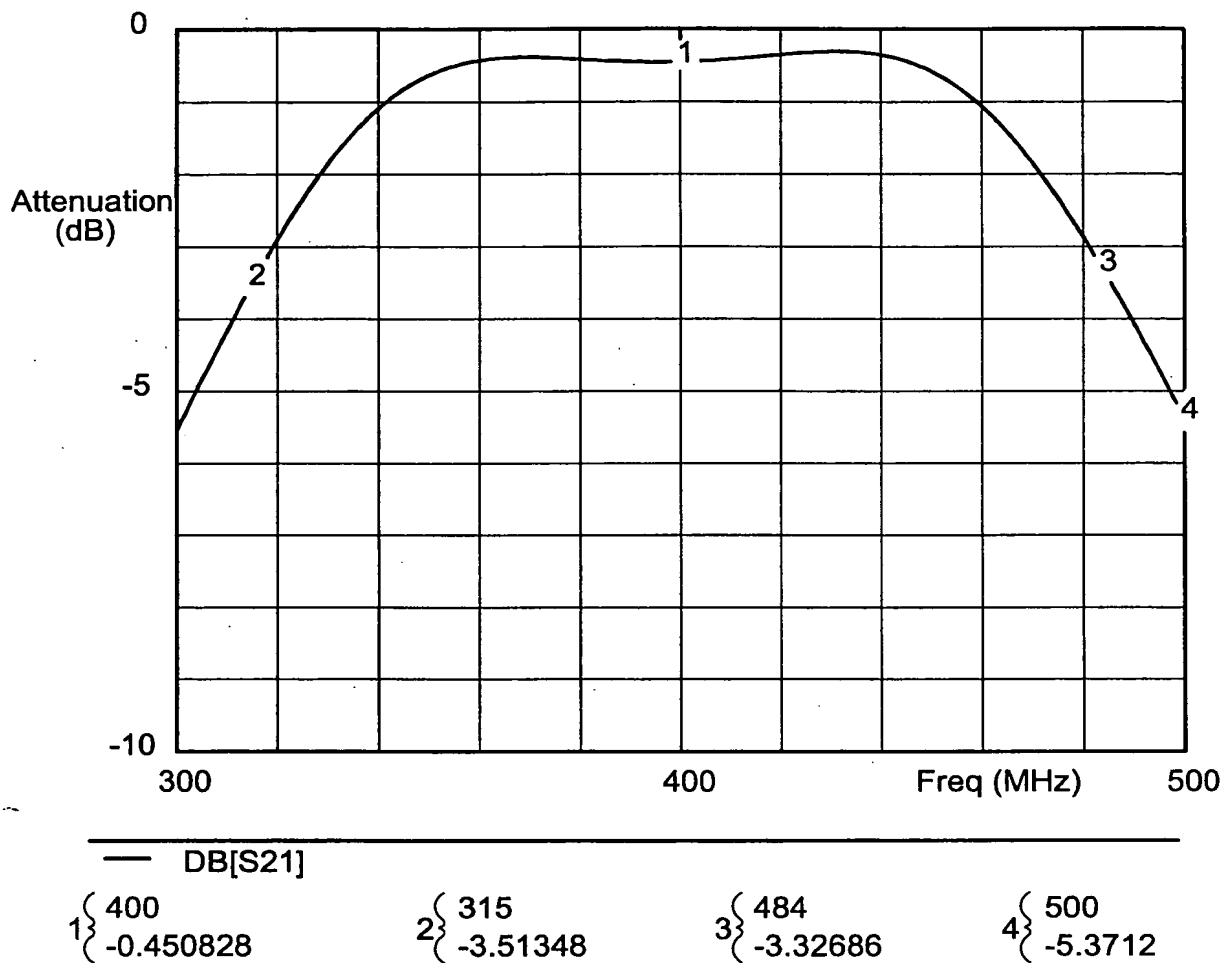


FIG. 22b

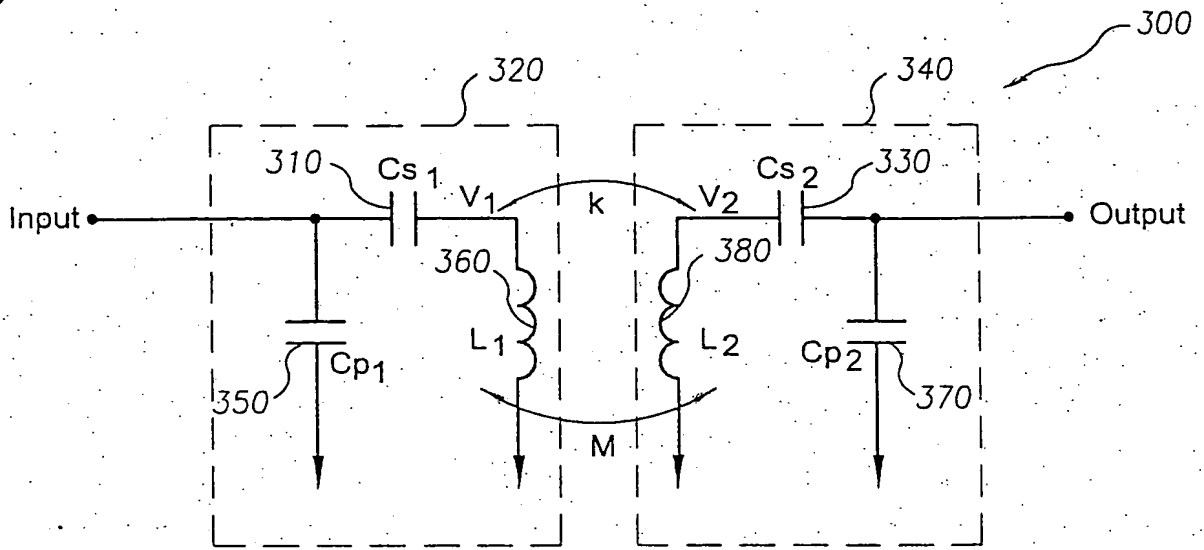
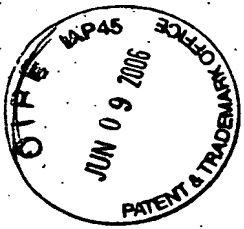
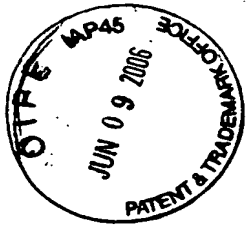


FIG. 23



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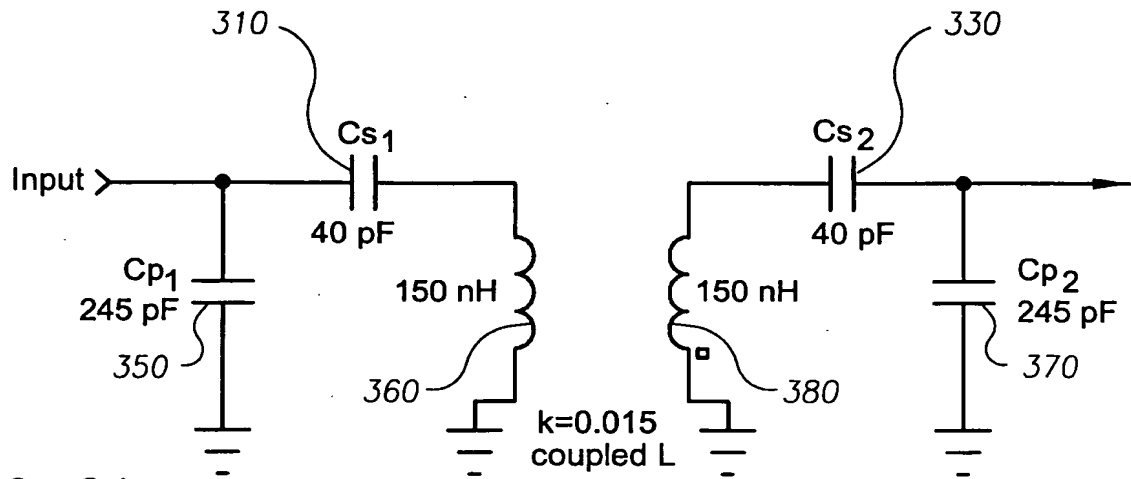


FIG. 24

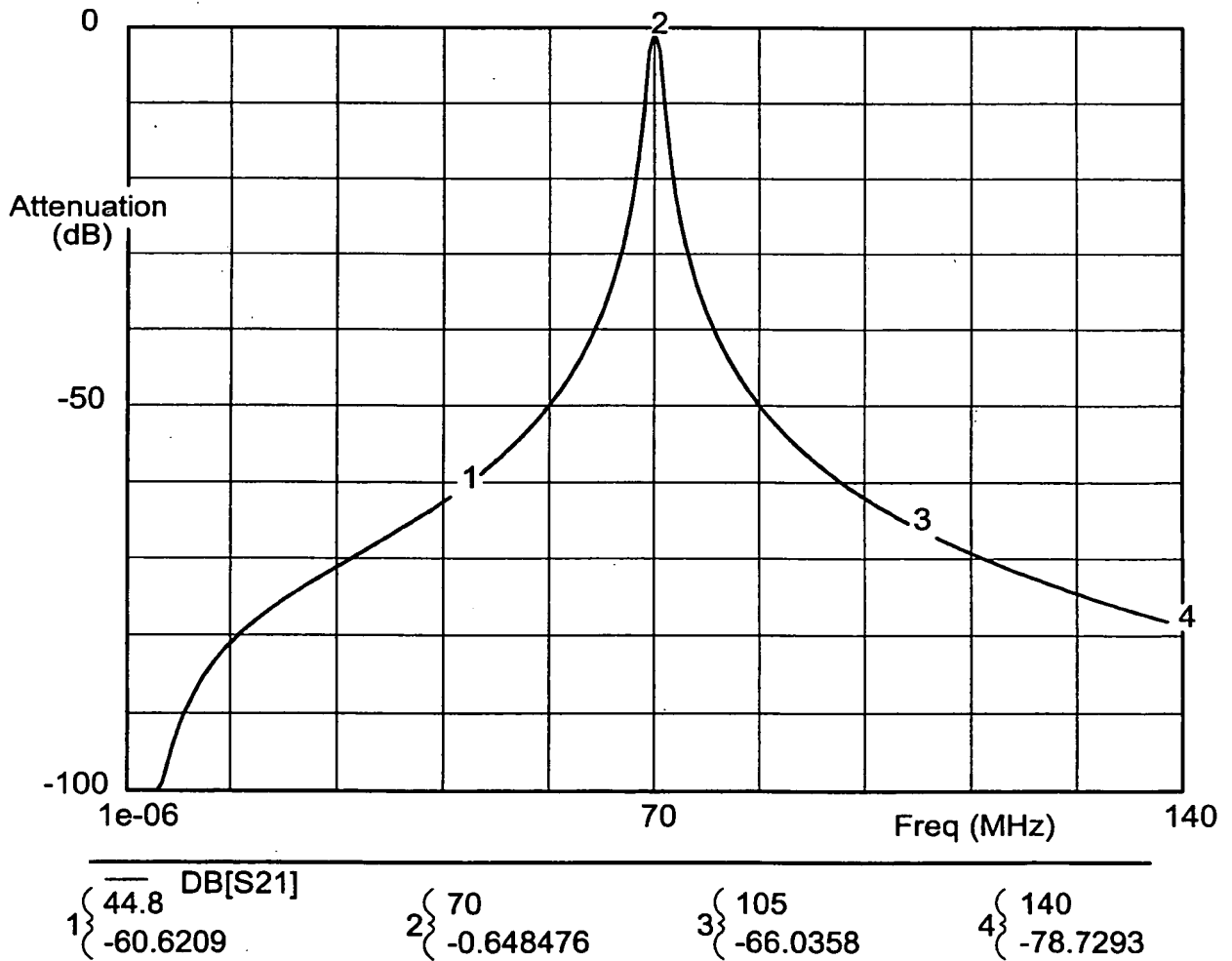
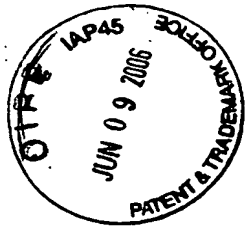


FIG. 25a



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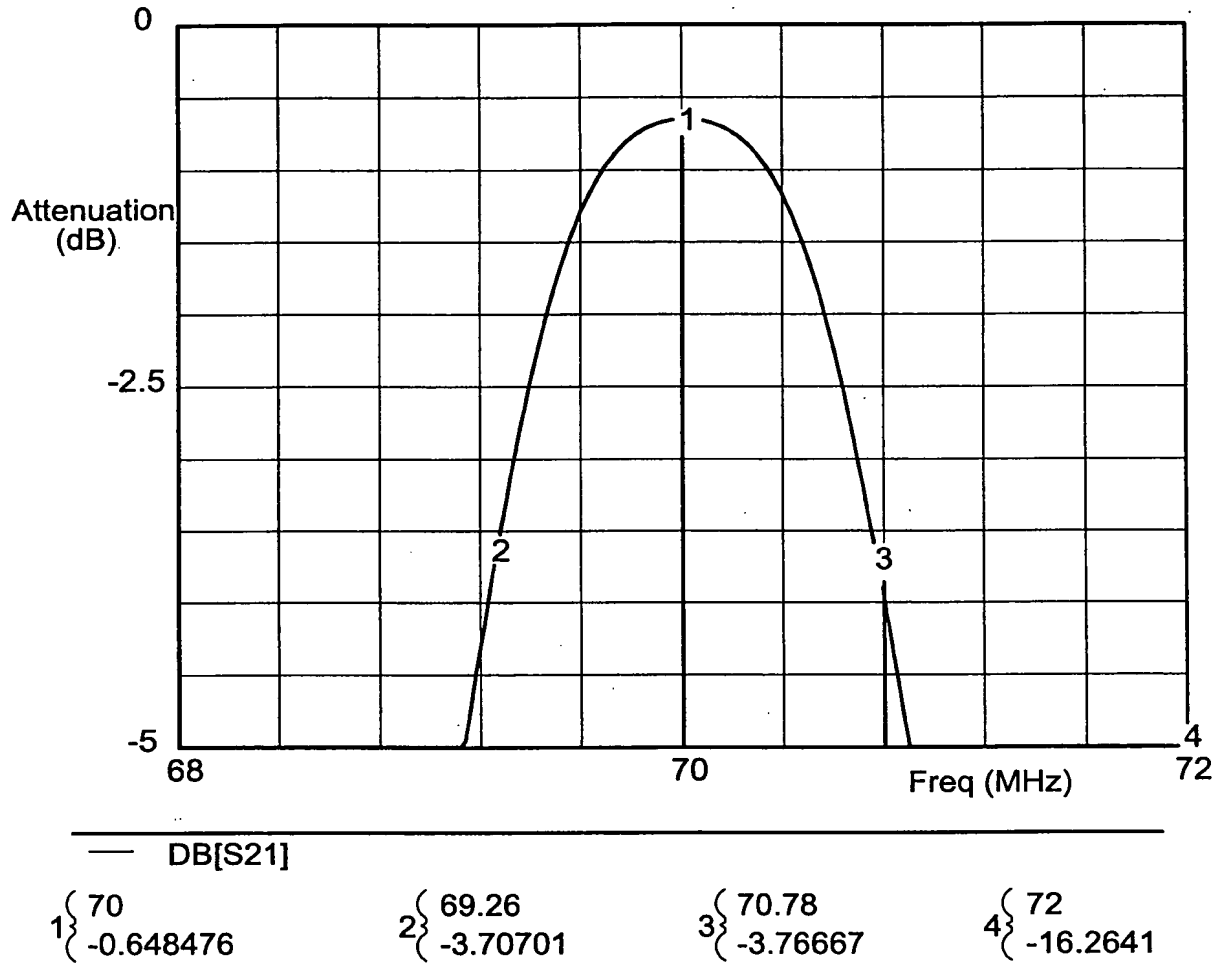
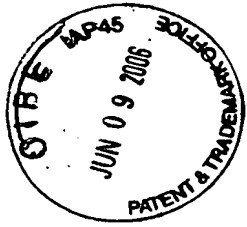


FIG. 25b



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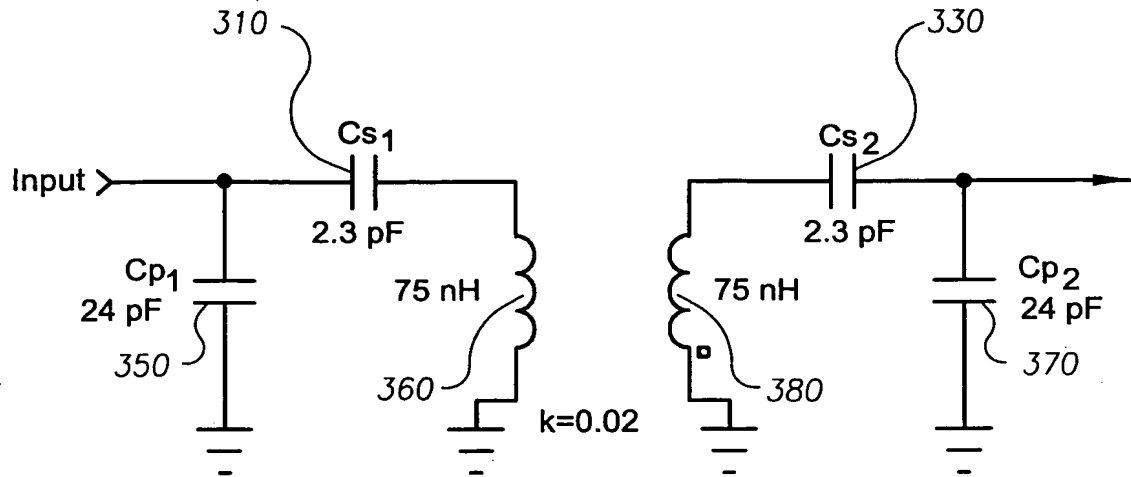


FIG. 26

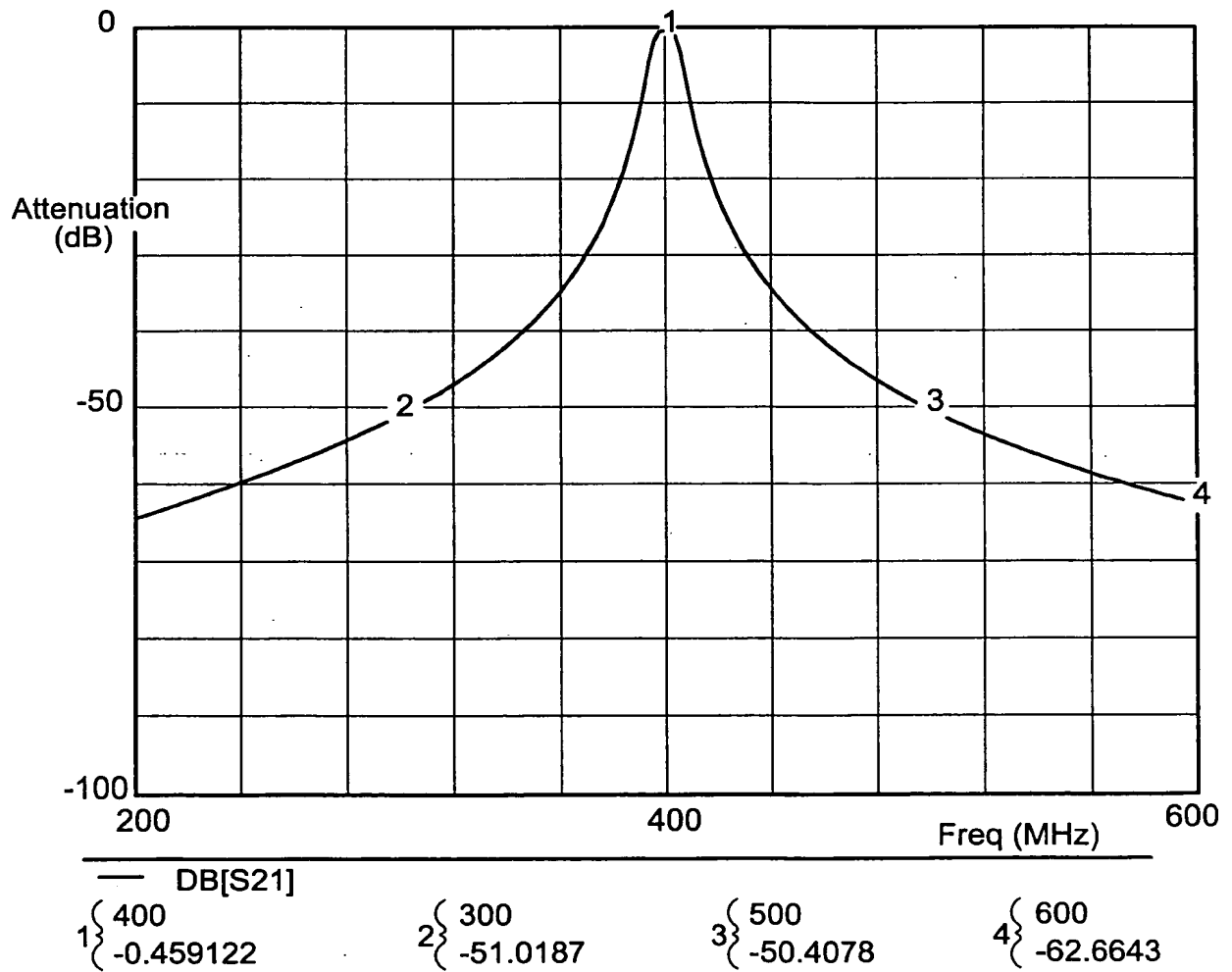
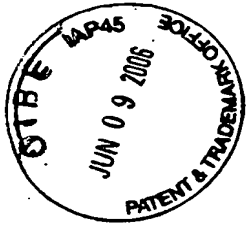


FIG. 27a



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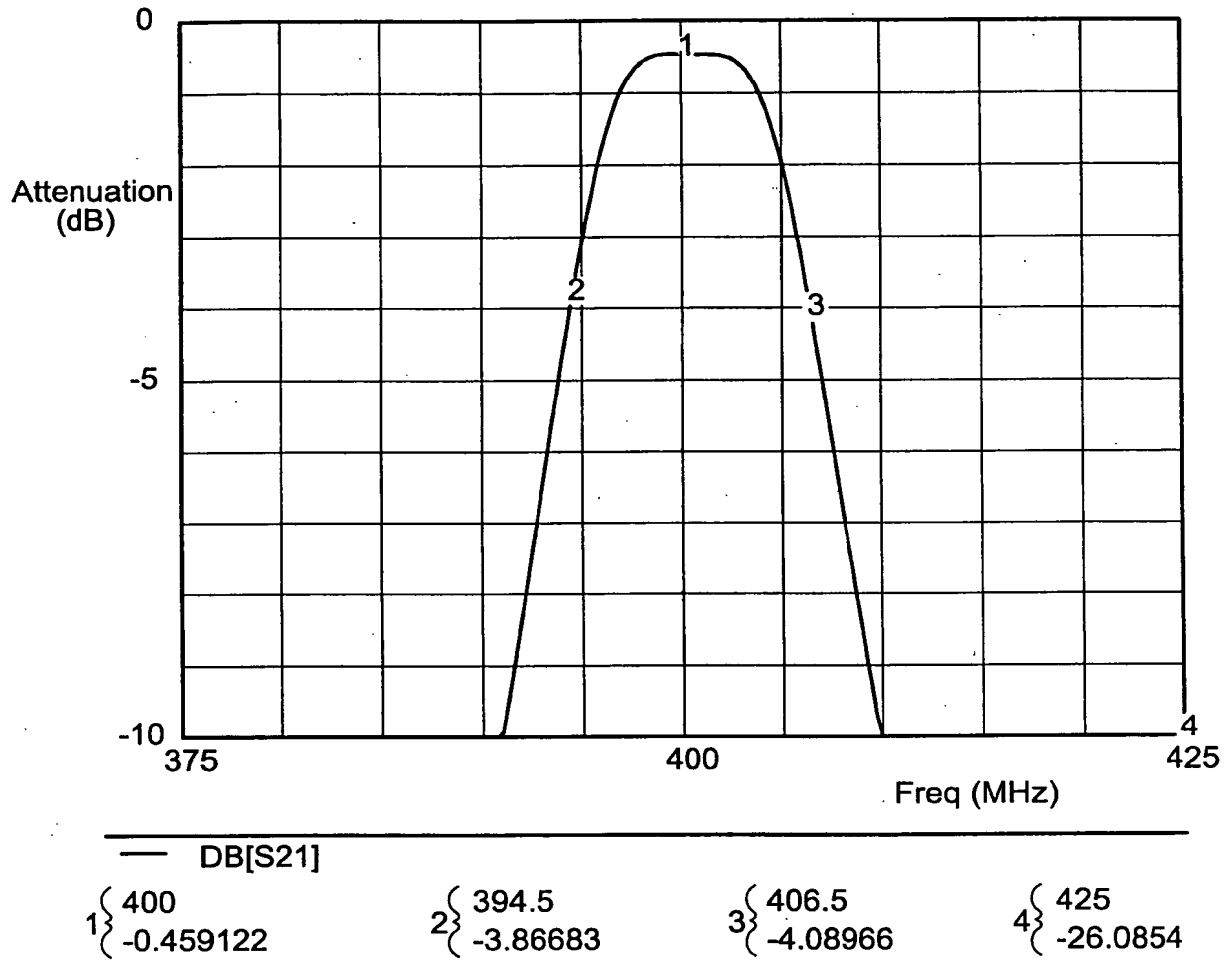
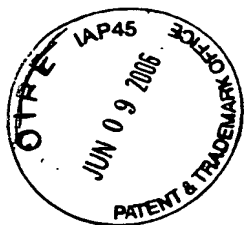


FIG. 27b



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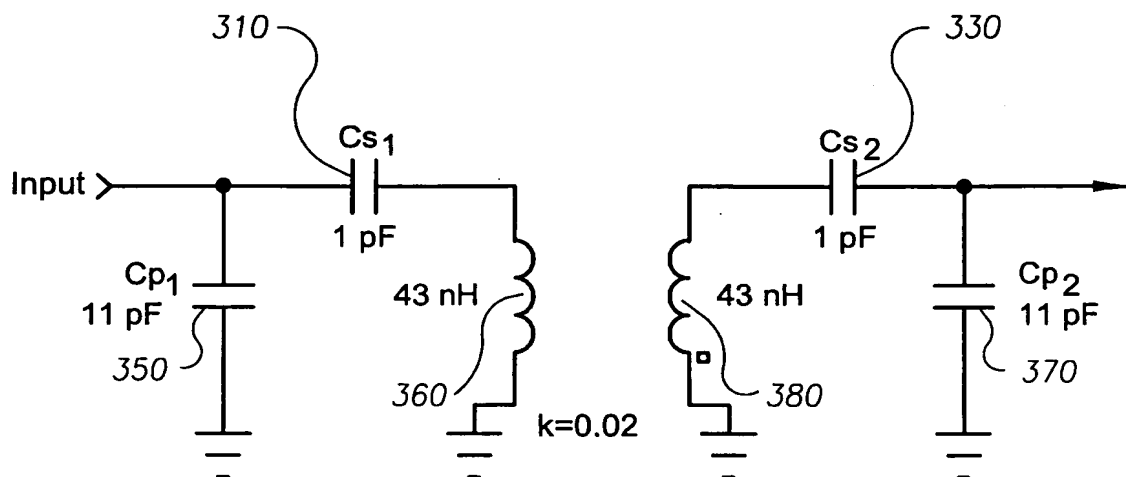


FIG. 28

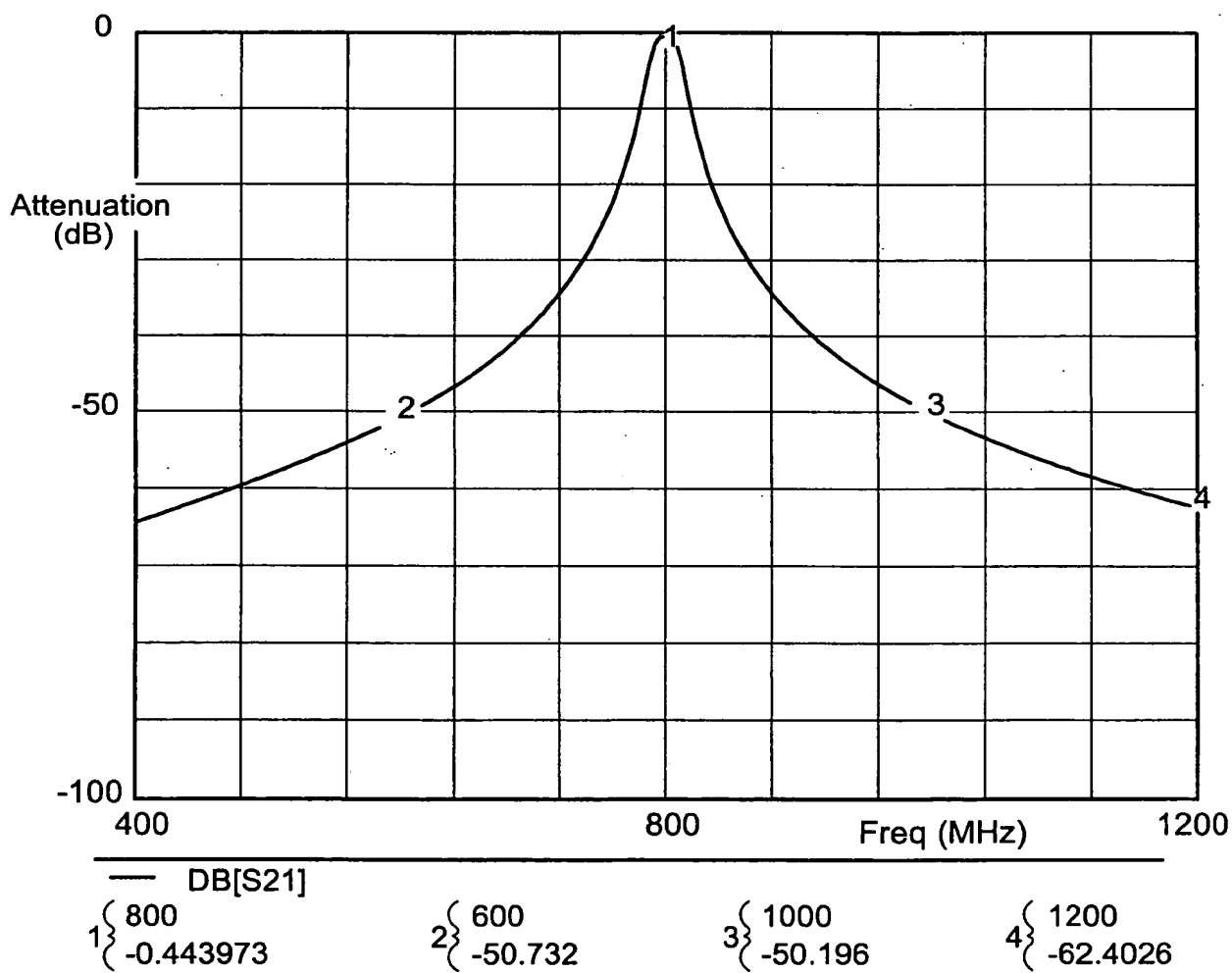
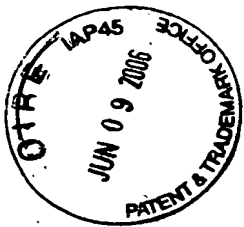


FIG. 29a



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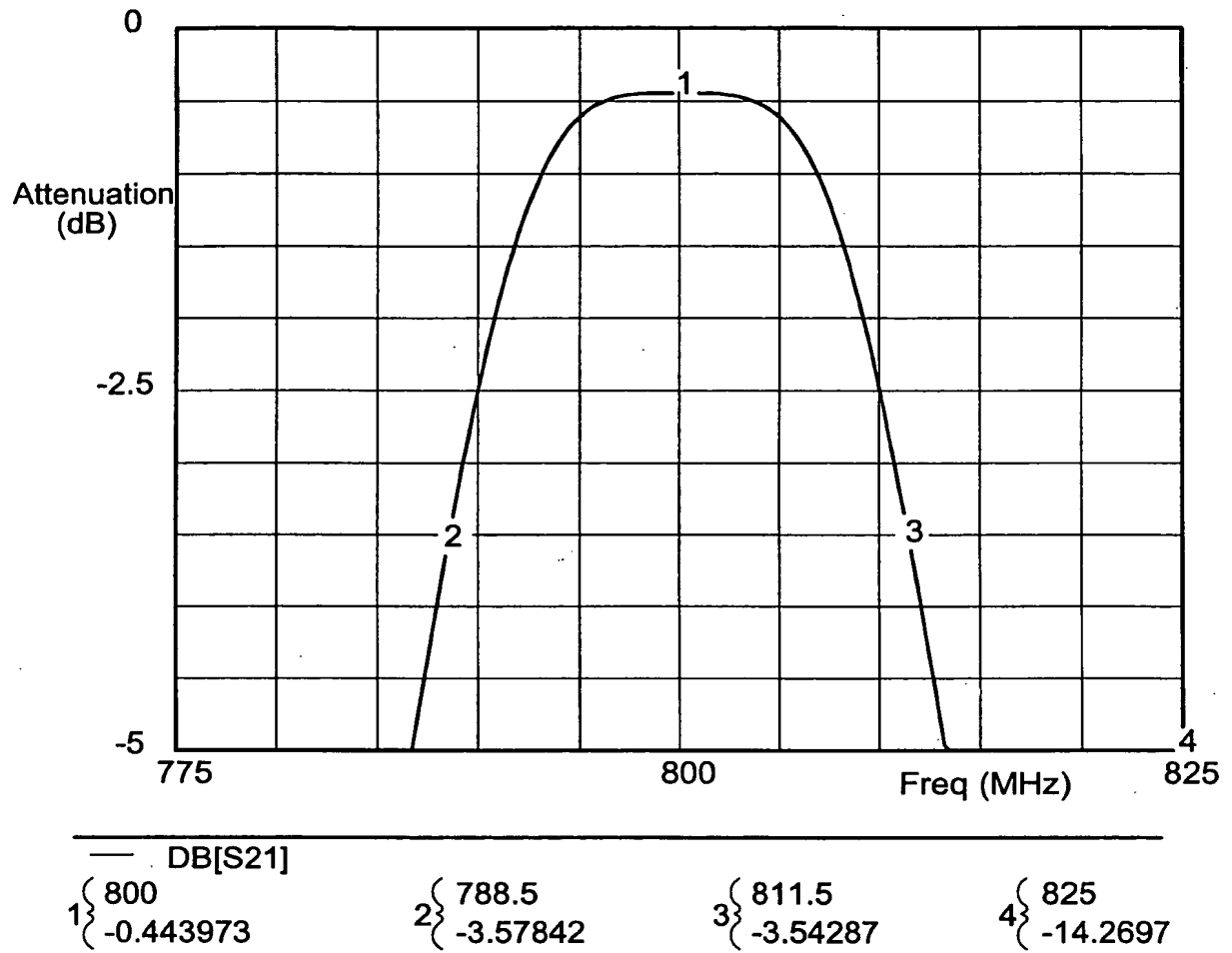
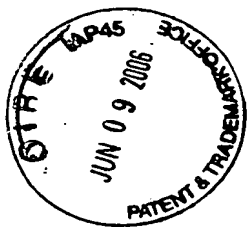


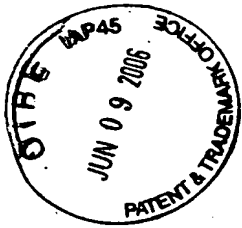
FIG. 29b



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Equivalent Inductance of Micro-Strip transmission lines used in example filters					
Dielectric constant = 4.65; Height = 1.5mm; Copper thickness: 0.018mm					
Filter Example #	Filter Center Frequency (MHz)	Length of uStrip line (mm)	Width of uStrip line (mm)	Percentage of wave-length (%)	Equivalent Inductance of uStrip line (nH)
4	70	12.25	1.5	0.6	6.1
5	400	4	1	1.1	2.4
6	500	3.9	3	2.3	1.3
7	400	5.36	3	1.5	1.8
8 (multiple microstrip lines connected in parallel)	400	5.5	3 lines connected in parallel each 2mm wide	1.8	(2.4 nH each) 0.72nH total (see note)
9	400	29.4	2	8.5	14
10 (multiple microstrip lines connected in parallel)	400	5.5	3 lines connected in parallel each 2mm wide	1.5	(2.4 nH each) 0.72nH total (see note)
Note: Adding more microstrip lines connected in parallel (multistrip lines), very low inductance values, in order of 0.5 nH, of high accuracy and repeatability are achievable. Considering the achievable tolerances in manufacturing (length and width of the lines), a tolerance of +/-2% of the inductance value of the multistrip lines is possible.					

FIG. 30



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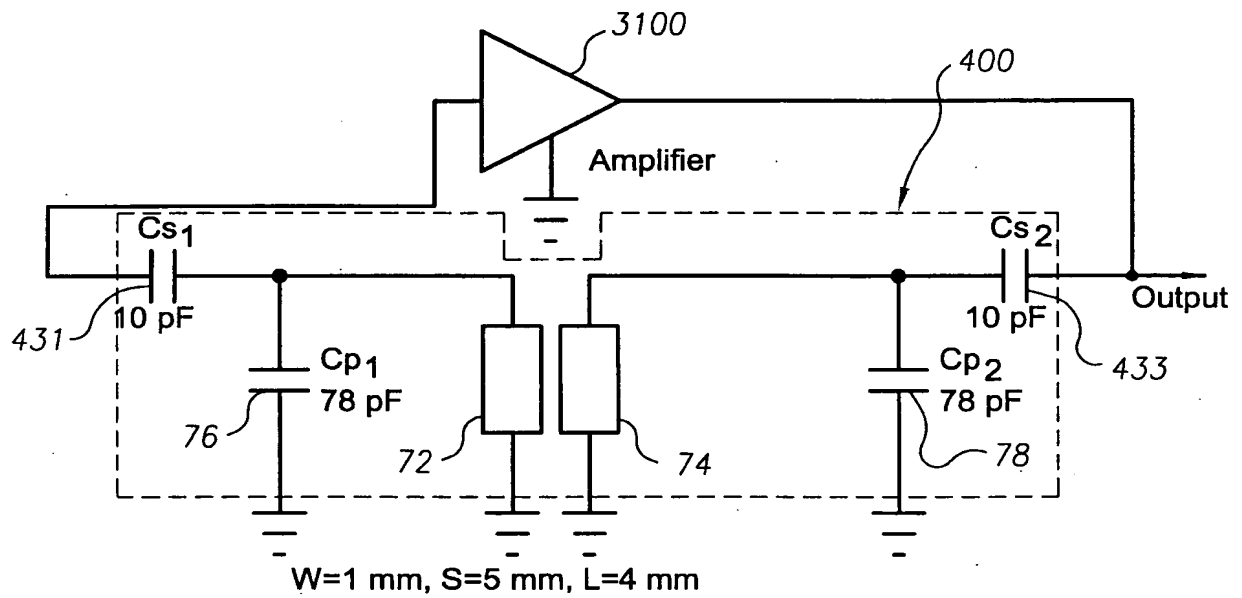
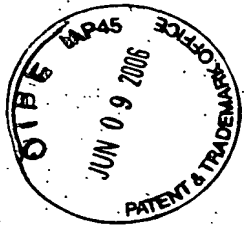


FIG. 31



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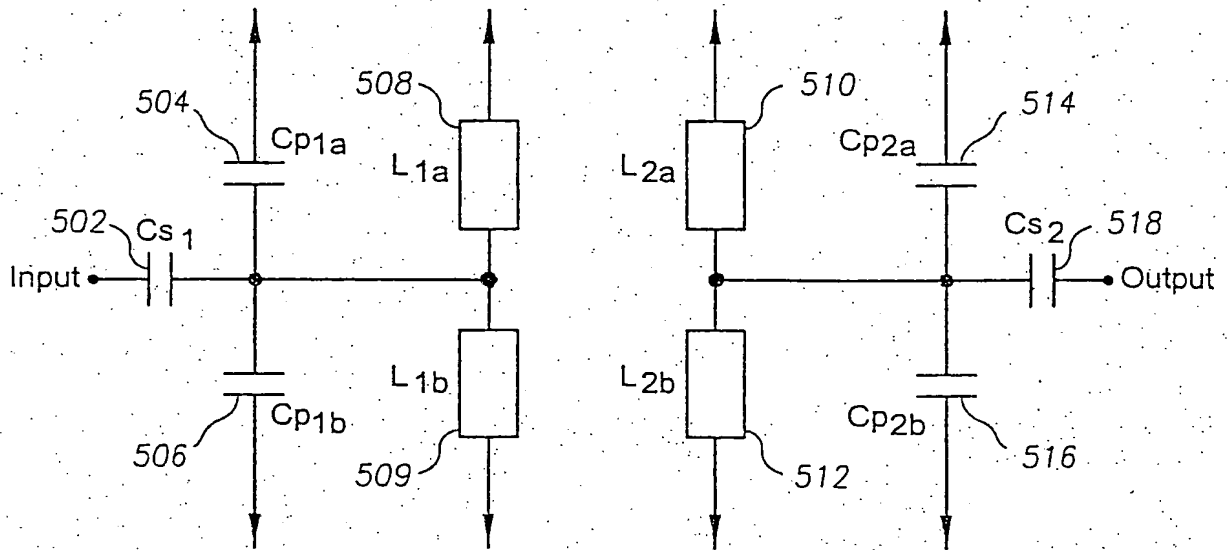
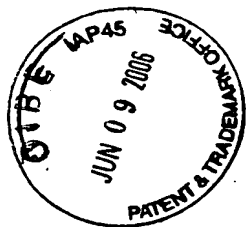


FIG. 32a



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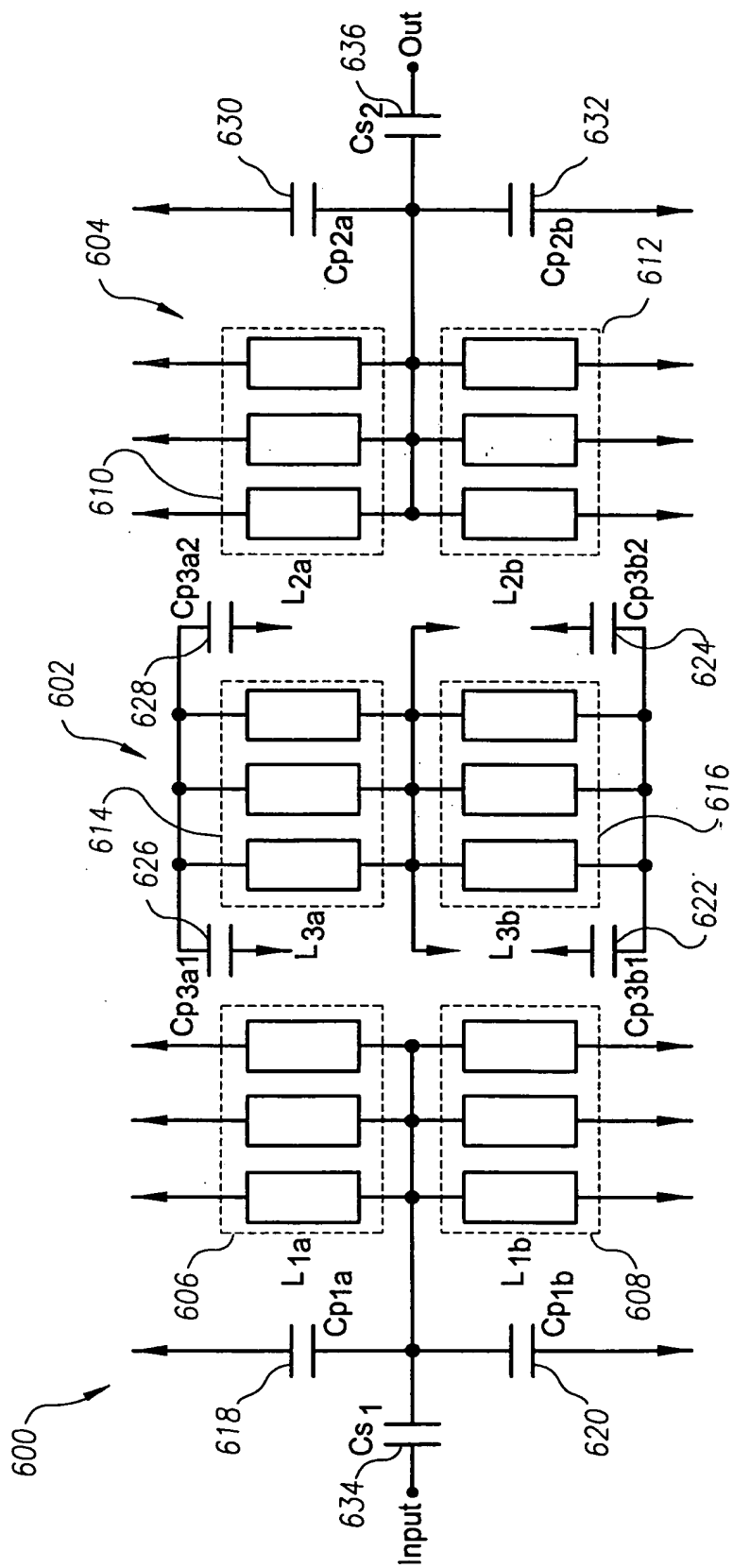


FIG. 32b

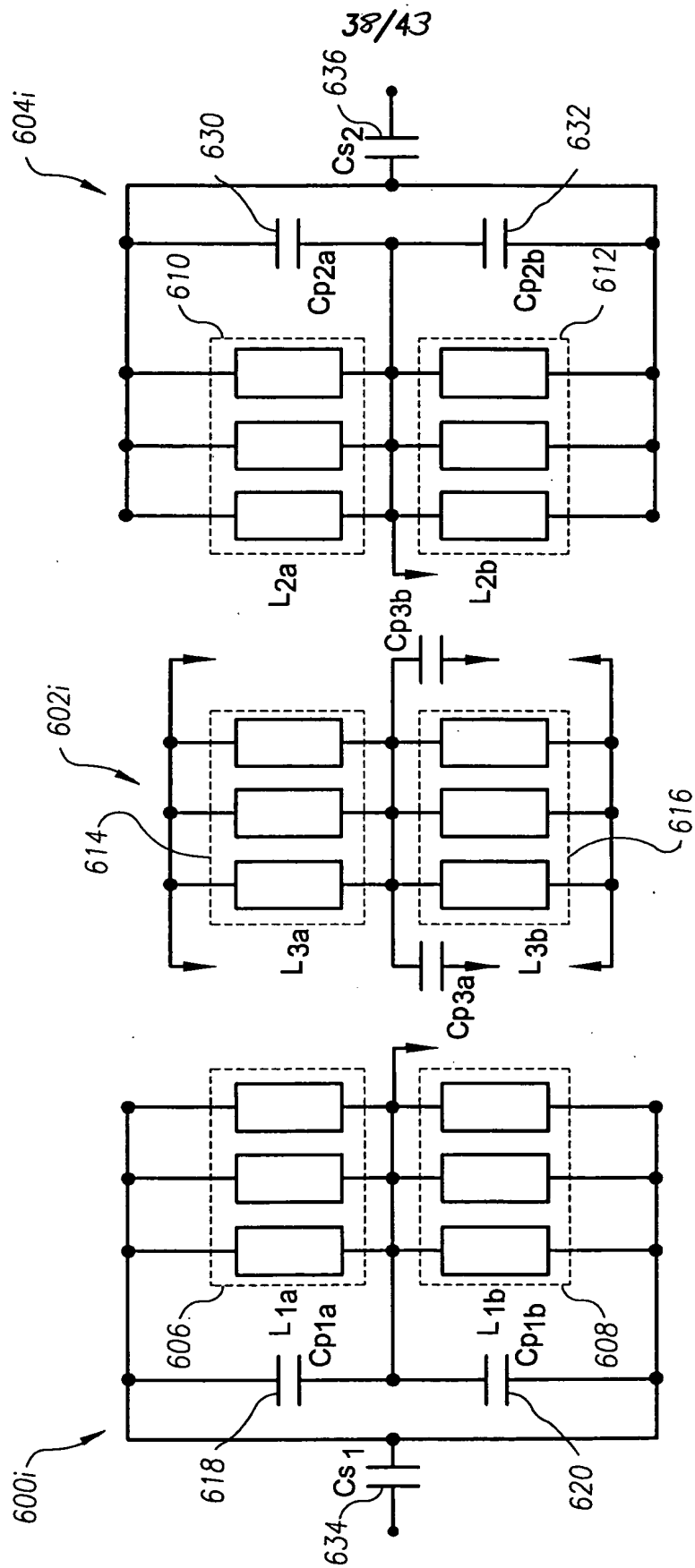
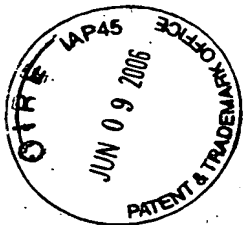
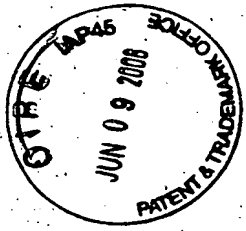
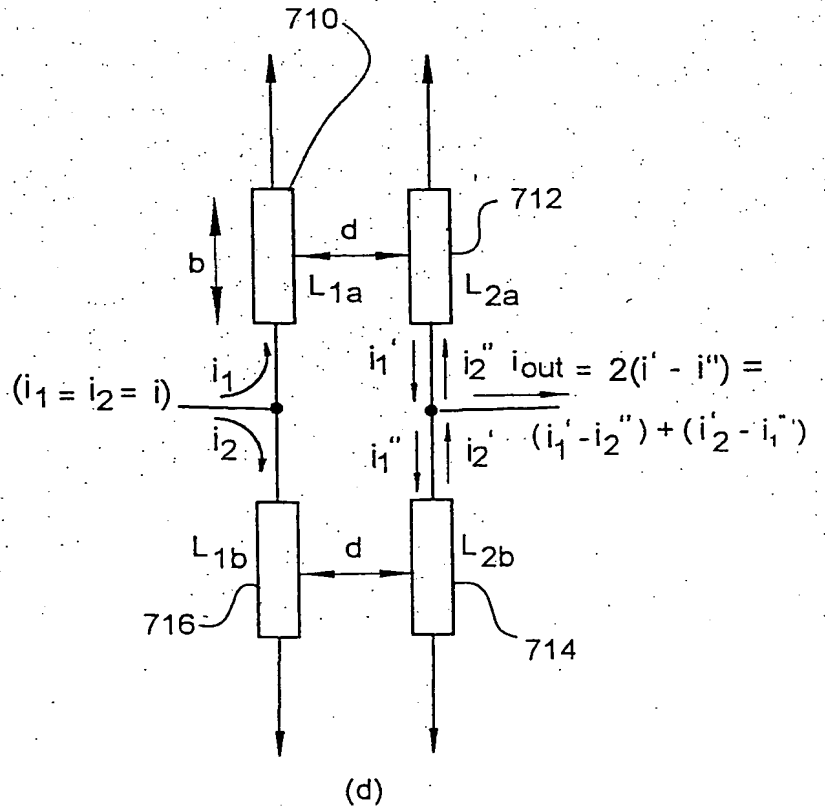
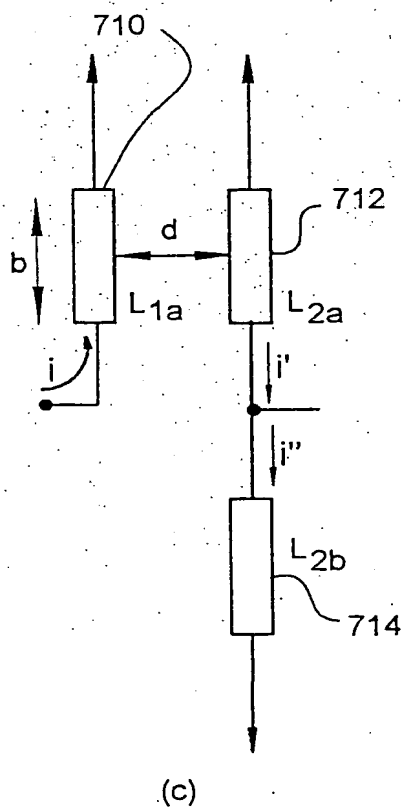
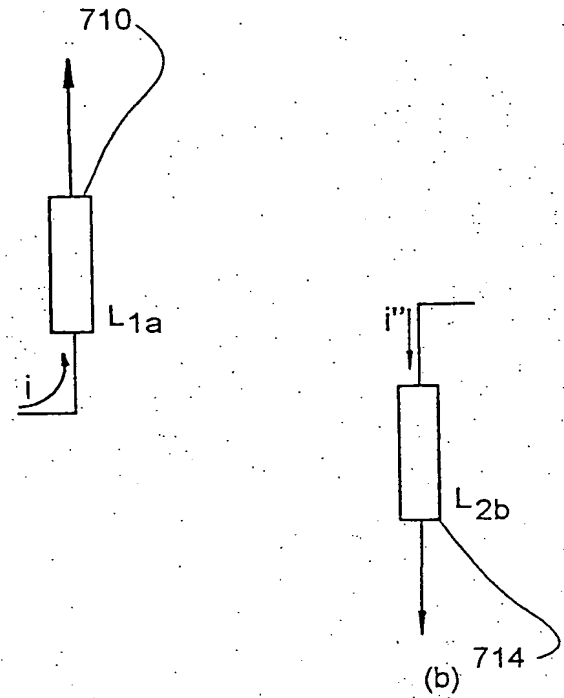
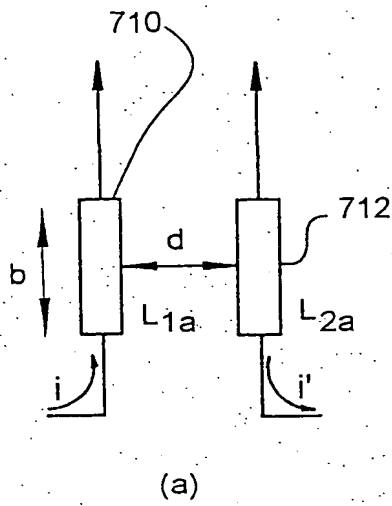


FIG. 32c

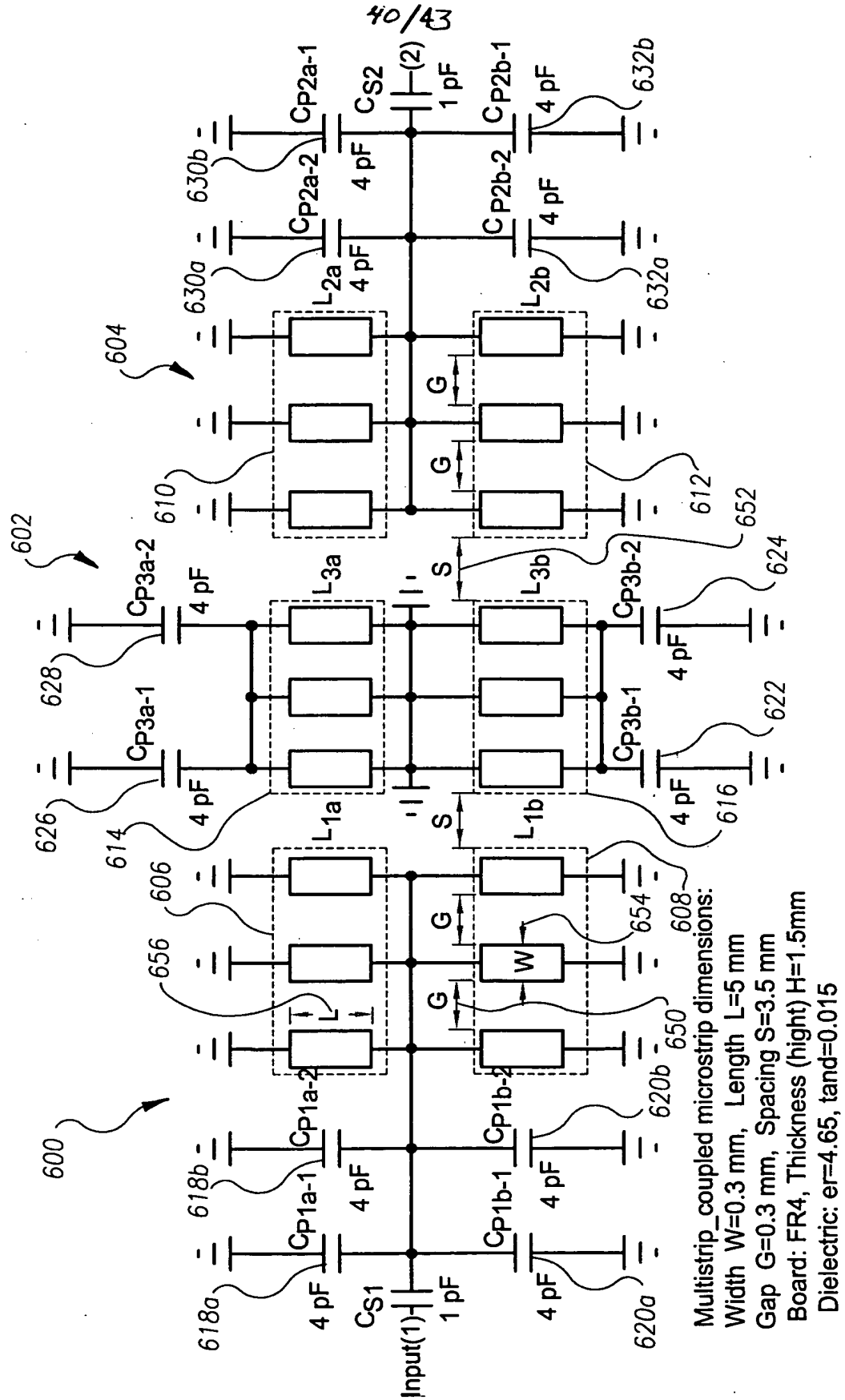


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$$(i_1 = i_2 = i) \quad i_1' \quad i_2' \quad i_{out} = 2(i' - i'') = (i_1' - i_2'') + (i_2' - i_1'')$$

FIG. 33



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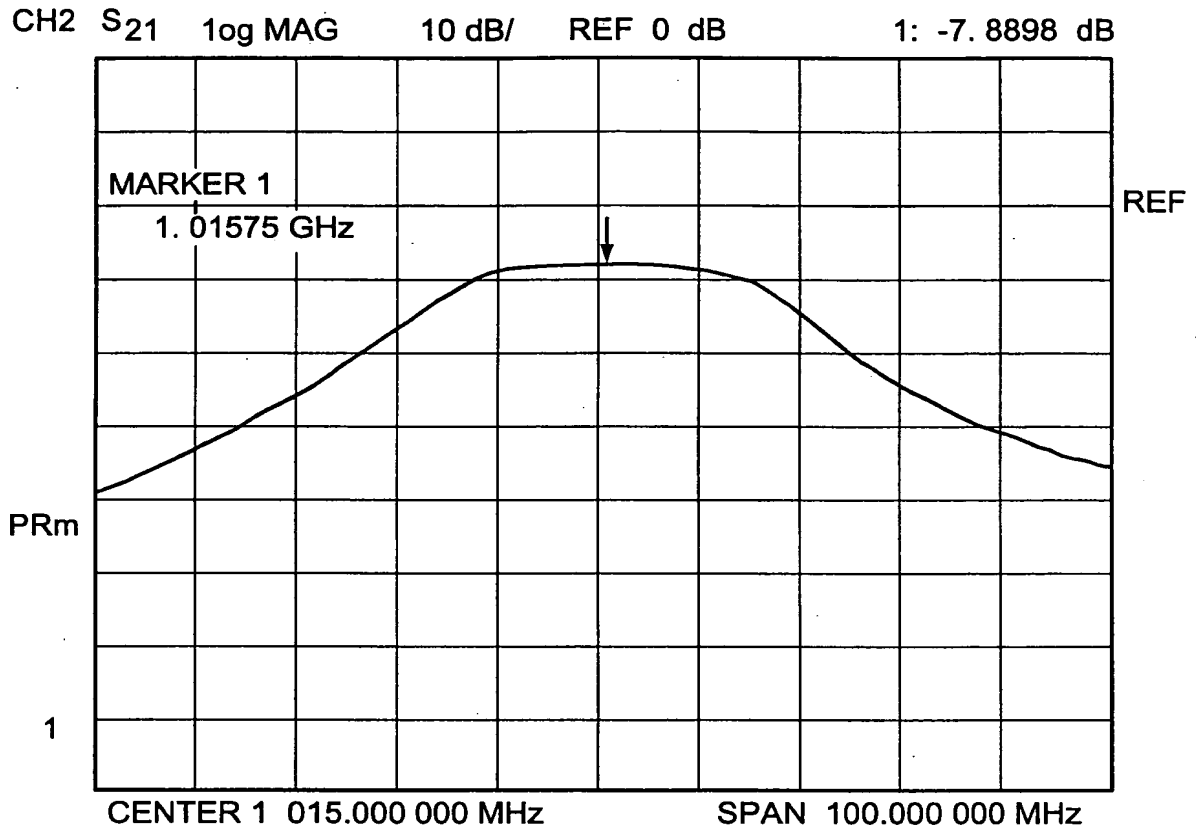
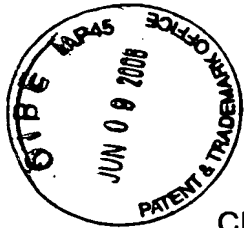


FIG. 34b



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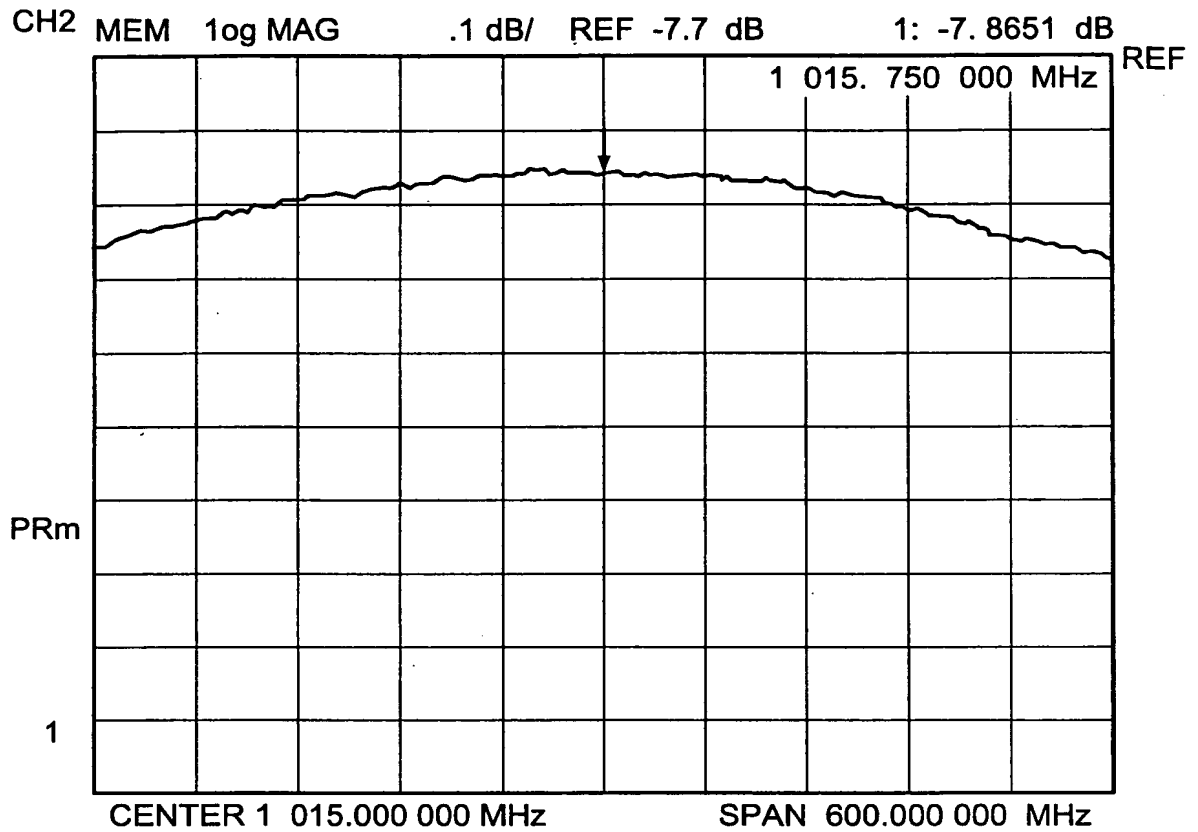


FIG. 34c

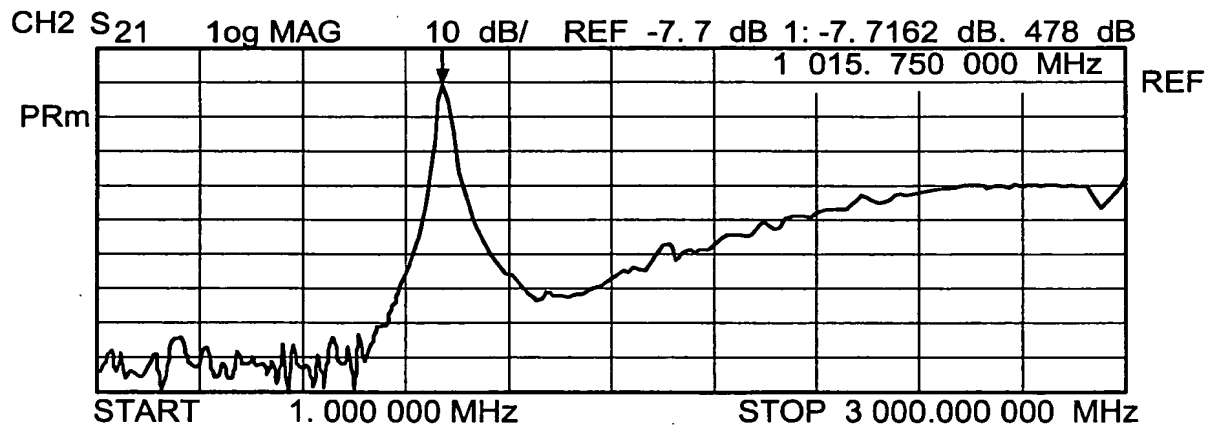


FIG. 34d



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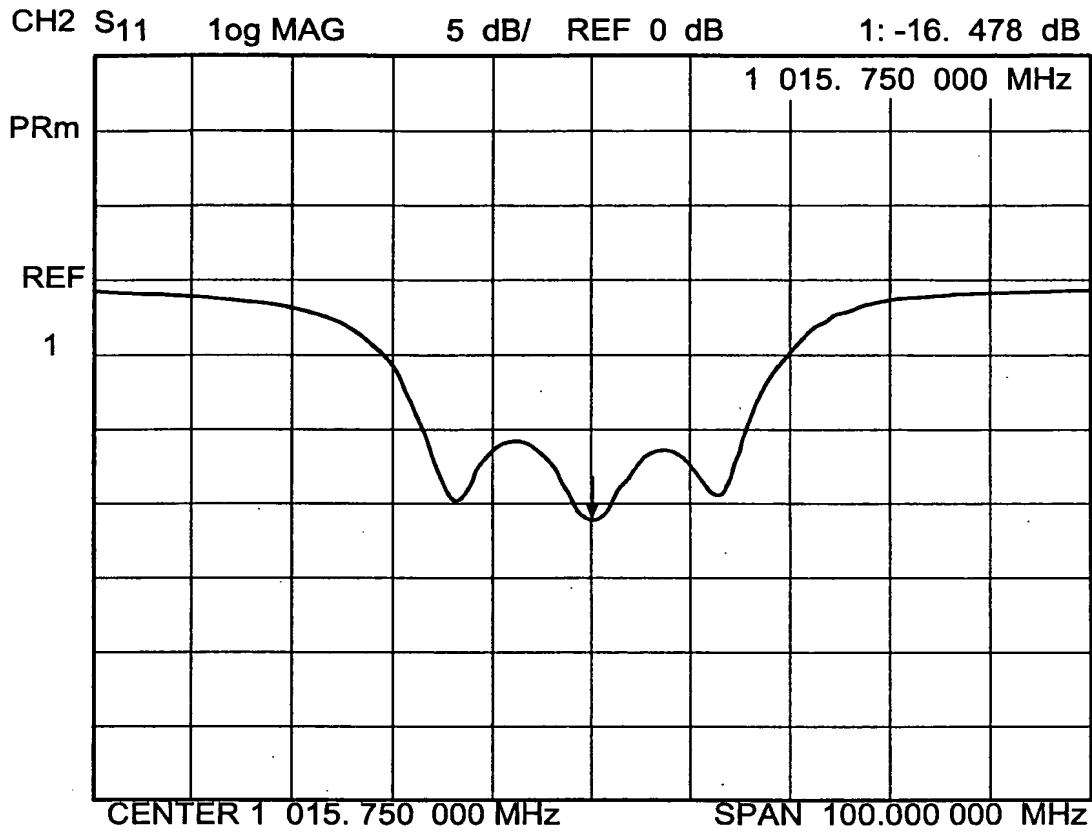


FIG. 34e